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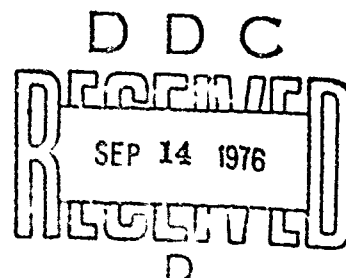
**USAF BIOENVIRONMENTAL NOISE DATA
HANDBOOK**

Volume 5

**MA-1A Power Unit, Gas Turbine Engine
(Continental)**

JUNE 1975

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AEROSPACE MEDICAL RESEARCH LABORATORY
AEROSPACE MEDICAL DIVISION
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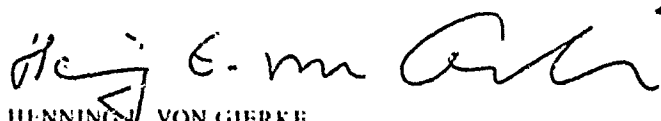
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FOR THE COMMANDER



HENNING L. VON GIERKE
Director
Biodynamics and Bionics Division
Aerospace Medical Research Laboratory

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number) The MA-1A Power Unit is a gas turbine driven air compressor for providing the sustained high mass flow necessary to operate pneumatic starters for aircraft jet engines and other pneumatically operated power equipment. This report provides measured and extrapolated data defining the bioacoustic environments produced by this unit operating outdoors on a concrete apron at normal rated/loaded conditions. Near-field data are reported for 37 locations		

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in a wide variety of physical and psychoacoustic measures: overall and band sound pressure levels, C-weighted and A-weighted sound levels, preferred speech interference level, perceived noise level, and limiting times for total daily exposure of personnel with and without standard Air Force ear protectors. Far-field data measured at 36 locations are normalized to standard meteorological conditions and extrapolated from 5-800 meters to derive sets of equal-value contours for these same seven acoustic measures as functions of angle and distance from the source. Refer to Volume 1 of this handbook, "USAF Bioenvironmental Noise Data Handbook, Vol 1: Organization, Content and Application," AMRL-TR-75-50(1) 1975, for discussion of the objective and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc.

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PREFACE

This report was prepared by the Biodynamic Environment Branch, Aerospace Medical Research Laboratory, under Project/Task 723104, Measurement of Noise and Vibration Environments of Air Force Operations.

The author acknowledges the efforts of Mr. Robert T. England and Mr. Robert G. Powell who conducted the field measurements, and Mr. John N. Cole who established the data analysis requirements and assisted in the preparation of this report. Mr. Henry Mohlman and Mr. David Eilerman of the University of Dayton assisted in the mechanics of data processing, and Mrs. Norma Peachy and Mr. Mike Patterson prepared the graphics.

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FAR-FIELD NOISE

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INTRODUCTION

The MA-1A Power Unit is a gas turbine driven air compressor for providing the sustained high mass flow necessary to operate pneumatic starters for aircraft jet engines and other pneumatically operated power equipment. This unit is manufactured by the Continental Aviation and Engineering Corporation.

This volume provides measured and extrapolated data defining the bioacoustic environments produced by this unit. Such data are essential to evaluate ear protection requirements, limiting personnel exposure times, voice communication capabilities, and annoyance problems associated with operations of the MA-1A power unit.

This volume is one of a series published by the Aerospace Medical Research Laboratory (AMRL) under the same report number (AMRL-TR-75-50) as a multi-volume handbook that quantifies the noise environments produced at flight/ground crew locations and in surrounding communities by operations of Air Force aircraft and aerospace ground equipment. The far-field, community-type, noise data in the handbook describe the noise produced during *ground operations* of aircraft, aerospace ground equipment, and other ground-based equipment or facilities.

Volume 1 of this handbook discusses the objectives and design of the handbook, the types of data presented, measurement procedures, instrumentation, data processing, definitions of quantities, symbols, equations, applications, limitations, etc. Volume 2 provides a method and data for adjusting the handbook's far-field noise data, which are for standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meters Hg barometric pressure) to derive comparable data for other meteorological conditions. *Refer to Volumes 1 and 2* (references 1 and 2) for such information because it is not repeated in other handbook volumes.

A cumulative index lists those aerospace systems contained in the handbook, and identifies the specific volumes containing each type of environmental noise data available (i.e., inflight/flight crew and passenger noise, near-field/ground crew noise, far-field/community noise). Volume numbers are assigned sequentially as individual volumes are published, and is available upon request from AMRL/BBE, Wright-Patterson AFB, OH 45433. Organizations on the distribution list for the handbook will automatically receive a copy of the updated index as it is generated.

Direct any questions concerning the technical data in this report and other handbook volumes to: AMRL/BBE, Wright-Patterson AFB, OH 45433; Autovon 78-53675 or 78-53664; Commercial (513) 255-3675 or (513) 255-3664.

NEAR-FIELD NOISE

MEASUREMENTS

A standard MA-1A power unit was operated outdoors on a concrete apron at normal rated conditions of 35,000 RPM, and loaded at 40 PSI and unloaded at 0 PSI with no significant sound-reflective surfaces present except the ground plane. Table 1 notes the surface meteorological conditions at the time of measurement.

Figure 1 identifies 72 noise measurement locations at a height of 1.5 meters above the concrete apron (nominal ear level of ground crew). The 0 degree reference direction passes through the tow bar. The 36 locations on the two inner circles are in the acoustic near-field of the source where the sound wave fronts generally do not spherically diverge and the source appears to be spatially distributed (i.e., not a point source). Consequently, these near-field data cannot be extrapolated to longer distances but do properly define the levels at locations close to the unit.

Near-field measurements were also made at ear level at the operator control panel. Table 1 lists the numerical/alphabetic designator used on the data pages in this report to identify the operator measurement location and test condition. The designator 1/A means operator location 1 and test condition A. Such a descriptor is essential in many handbook volumes that involve multiple combinations of locations/conditions. It is used in this report to maintain format consistency.

RESULTS

The measured data presented in Table 2 define the sound pressure levels (SPL) produced by the MA-1A unit at the 37 specified, near-field locations. This table includes the overall, 1/3 octave band, and octave band levels. From these data one can calculate the variety of measures in Table 3 which are widely used to assess the effects of noise on personnel and their performance.

For data at other intermediate near-field locations (i.e., for radial distances less than 5 meters) you can interpolate between the 72 measured data points. All near field data are for the meteorological conditions at the time of test but are valid for all typical airbase meteorology because of the short distances over which the sound is propagated.

TABLE 1
MEASUREMENT LOCATION AND TEST CONDITION
FOR OPERATOR NOISE MEASUREMENTS

MA-1A Power Unit, Gas Turbine Engine (Continental)
Eglin AFB, 9 Aug 1971
Serial # 283559DEG1351

Measurement Location

1 Operator Control Panel

AGE Operation

A 35,000 RPM
Unloaded (0 PSI)

Meteorology

Temperature 31 C
Bar Pressure .761 M Hg
Rel Humidity 63%

FAR-FIELD NOISE

MEASUREMENTS

Noise measurements were also made on the same MA-1A unit under the same loaded test conditions at the outer circle locations on Figure 1. These 36 locations are in the acoustic far-field of the source where the sound wave fronts spherically diverge and the unit may be regarded as a point noise source. Under these far-field conditions, the measured data can be extrapolated to longer distances.

RESULTS

Table 4 lists the overall and 1/3 octave band SPL measured at the 36 far-field locations under the meteorological conditions at the time of test. These data were normalized to 10 meters distance and standard meteorological conditions (15C temperature, 70% rel humidity, 0.760 meter Hg barometric pressure) and used to derive the graphic data in Figure 2 which provides a compact summary of the far-field noise characteristics of the MA-1A power unit in a standard format.

These measured data were also used to derive sets of equal noise contours (Figures 3 through 9) describing seven different measures of noise as functions of angle and distance from the source for standard day meteorology. Note that Figure 8 contours identify limiting exposure times for personnel. Missing data points on any of the contours are the result of eliminating measured data which contained excessive influence of spurious background noise present at the time of measurement. In some cases contour levels at these missing data points were estimated and indicated with dashed lines.

Volume 2 of the handbook defines the influence of meteorology on far-field noise environments and provides, if required, the factors necessary to adjust the handbook standard meteorological day data.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)																
1/3 OCTAVE BAND																
2																
NOISE SOURCE/SUBJECT: (OPERATION:)																
HA-1A POWER UNIT, GAS (35,000 RPM (100%))																
TURBINE ENGINE (CONTINENTAL) (LOADED (40 PSI))																
NEAR FIELD NOISE LEVELS ()																
FREQ (HZ)	DISTANCE (M) -->	2	20	2	2	2	2	2	2	2	2	2	2	2	2	2
ANGLE (DEG) -->	0	20	40	60	80	100	120	140	160	180	200	220	240			
25	78	81	78	78	77	77	76<	78	80	81	80	80	80			
31.5	81	81	81	83	81	79	81	81	84	85	84	82	82			
40	84	83	83	83	83	83	82	84	85	86	85	85	84			
50	84	86	86	86	85	86	86	86	85	88	88	86	86			
63	87	86	88	88	87	87	87	87	87	91	89	88	88			
80	88	89	90	89	90	88	89	88	89	89	88	88	88			
100	92	94	94	93	94	94	94	94	96	97	94	95	95			
125	100	101	100	99	100	99	101	103	105	105	104	102	102			
160	103	102	102	102	102	104	106	109	110	110	109	108	108			
200	103	102	102	103	105	108	110	111	113	114	113	112	111			
250	97	97	96	98	100	101	103	105	108	110	109	108	106			
315	99	98	96	95	96	97	98	101	103	104	102	101	99			
400	99	98	97	97	97	98	99	102	104	105	104	102	100			
500	99	99	99	97	98	99	101	102	104	105	104	101	100			
630	99	100	99	97	99	100	100	102	104	105	103	100	99			
800	101	99	95	95	96	97	94	99	105	109	102	96	97			
1000	99	96	93	94	95	93	94	99	105	109	104	97	95			
1250	93	91	90	92	95	92	95	99	104	106	103	98	95			
1600	90	88	88	88	89	89	93	90	98	101	97	95	92			
2000	86	88	88	87	89	88	91	95	96	98	96	93	91			
2500	86	90	88	87	87	88	89	94	93	94	93	92	90			
3150	84	89	89	85	85	86	88	92	93	94	92	91	88			
4000	88	91	91	87	87	88	89	94	94	95	93	92	90			
5000	96	97	96	91	92	92	93	96	96	99	96	94	93			
6300	89	95	96	91	91	93	93	99	99	101	98	96	93			
8000	93	96	99	94	95	97	98	103	103	104	104	100	98			
10000	97	101	102	97	98	100	101	104	105	107	106	102	100			
OVERALL	111	111	111	110	111	112	114	116	118	120	118	116	115			
< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.																

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)																IDENTIFICATION:	
1/3 OCTAVE BAND																	
2																OMEGA 3.2	
NOISE SOURCE/SUBJECT: (OPERATION:)																TEST 71-020-280	
HA-1A POWER UNIT, GAS (35,000 RPM (100%))																RUN 02	
TURBINE ENGINE (LOADED (49 PSI))																03 SEP 74	
(CONTINENTAL) ()																	
NEAR FIELD NOISE LEVELS ()																PAGE F2	
FREQ (HZ)	DISTANCE (M) -->	2	260	280	300	320	340	2	1	0	20	40	60	80	100	120	140
25	79	79	79	79	78	80	78	86	87	86	87	87	88	91	92	89	92
31.5	62	80	80	80	80	79	81	85	88	85	88	88	88	91	91	93	93
40	84	85	83	83	83	83	83	89	89	89	89	90	91	93	95	94	95
50	86	86	86	86	85	85	85	90	91	90	91	92	92	95	97	96	97
63	87	87	87	87	87	87	86	93	93	93	93	94	95	97	96	98	97
80	89	88	88	88	89	88	88	96	96	96	96	97	97	98	99	100	101
100	95	96	95	94	95	94	93	102	102	102	102	102	103	101	103	104	105
125	101	101	101	100	101	100	101	107	107	107	107	108	107	105	108	110	111
160	106	106	106	103	104	103	103	105	104	104	104	104	106	106	109	111	113
200	108	108	108	104	107	104	103	105	103	105	103	105	106	108	109	113	114
250	103	102	102	99	101	99	97	105	103	103	102	103	102	103	105	108	110
315	97	96	96	96	95	96	98	102	101	102	101	102	101	102	104	105	107
400	99	97	97	98	97	98	98	103	103	103	103	103	105	103	107	109	112
500	100	99	99	98	99	98	98	100	105	105	105	105	105	105	109	112	113
630	99	99	99	97	95	97	98	102	103	103	101	101	100	104	106	106	106
800	98	97	97	95	95	94	100	103	100	103	99	99	99	101	103	103	105
1000	97	95	95	94	95	94	95	102	98	98	97	97	98	102	103	101	109
1250	96	95	95	92	92	90	90	96	94	96	94	95	97	101	100	102	108
1600	90	89	89	88	89	88	88	90	92	90	92	94	93	96	97	101	104
2000	89	88	88	87	87	88	86	88	91	88	91	93	92	93	95	98	100
2500	88	86	86	86	86	88	87	88	89	88	89	92	91	92	94	96	100
3150	86	84	84	85	87	87	88	85	88	85	88	92	90	90	93	95	98
4000	89	86	86	87	87	89	90	87	92	87	92	95	92	91	94	95	99
5000	93	90	90	90	94	94	98	94	99	94	99	99	95	94	99	98	101
6300	92	88	88	88	88	90	89	89	95	89	95	98	95	94	99	100	103
8000	98	92	92	92	92	93	93	92	96	92	96	100	99	98	104	105	108
10000	100	96	96	96	96	97	98	97	100	97	100	104	102	102	106	108	110
OVERALL	113	112	111	111	111	110	111	114	114	114	114	115	115	116	118	120	122

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE 1 MEASURED SOUND PRESSURE LEVEL (DB)														IDENTIFICATION:	
2 1/3 OCTAVE BAND															
NOISE SOURCE/SUBJECT:															
HA-1A POWER UNIT, GAS														OMEGA 3.2	
TURBINE ENGINE														TEST 71-020-280	
(CONTINENTAL)														RUN 03	
NEAR FIELD NOISE LEVELS														03 SEP 74	
														PAGE F3	
DISTANCE (H) -> 1														OPERATOR LOCATION	
ANGLE (DEG) -> 160														TEST CONDITION	
														1/A	
FREQ (HZ)	1	180	200	220	240	260	280	300	320	340	360	380	400		
25	93	91	93	94	91	89	89	87	87	87	87	87	87	81	
31.5	96	96	96	95	93	91	89	90	87	88	88	88	88	82	
40	97	97	96	96	94	94	92	91	90	89	89	89	89	85	
50	98	97	98	97	95	93	92	92	92	91	91	91	91	87	
63	100	98	99	100	96	96	94	94	93	93	93	93	93	89	
80	102	101	101	100	99	98	98	97	96	96	96	96	96	92	
100	106	105	106	106	104	104	103	102	103	103	103	103	103	93	
125	112	113	113	112	110	108	107	106	107	107	107	107	107	99	
160	115	114	115	114	113	110	109	108	106	105	105	105	105	102	
200	117	117	118	117	113	110	110	108	108	108	108	108	108	105	
250	113	114	113	112	108	104	102	102	103	104	104	104	104	100	
315	110	112	109	107	103	101	99	99	101	101	101	101	101	97	
400	114	114	113	111	107	105	103	103	103	103	103	103	103	98	
500	115	116	116	113	110	107	106	106	104	104	104	104	104	98	
630	109	111	109	109	108	107	103	102	103	103	103	103	103	97	
800	108	109	106	102	104	103	99	98	98	102	102	102	102	96	
1000	114	116	113	109	101	103	100	99	98	99	99	99	99	95	
1250	112	114	111	108	100	103	98	96	96	96	96	96	96	92	
1600	107	108	106	104	99	97	94	94	94	91	91	91	91	88	
2000	104	106	104	101	97	95	93	93	93	91	91	91	91	89	
2500	101	102	100	99	95	95	92	93	94	94	94	94	94	91	
3150	101	102	100	98	94	92	91	90	91	86	86	86	86	96	
4000	102	102	101	97	94	92	91	92	94	89	89	89	89	99	
5000	105	106	103	101	99	96	96	95	99	93	93	93	93	109	
6300	106	108	105	103	99	95	92	93	94	89	89	89	89	92	
8000	111	111	110	108	103	100	96	97	98	92	92	92	92	95	
10000	113	114	112	110	100	102	102	102	103	96	96	96	96	103	
OVERALL	125	125	125	123	120	116	116	115	115	114	114	114	114	113	

LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)													IDENTIFICATION:			
1/3 OCTAVE BAND																
2																
NOISE SOURCE/SUBJECT: (OPERATION:)																
HA-1A POWER UNIT, GAS (35,000 RPM (100%))																
TURBINE ENGINE (UNLOADED (0 PSI))																
(CONTINENTAL) ()																
HEAR FIELD NOISE LEVELS ()																
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< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		OCTAVE BAND										IDENTIFICATION:	
2												OMEGA 3.2	
NOISE SOURCE/SUBJECT:		OPERATION:										TEST 71-020-280	
MA-1A POWER UNIT, GAS		(RUN 01	
TURBINE ENGINE		(03 SEP 74	
(CONTINENTAL)		(
NEAR FIELD NOISE LEVELS		(PAGE J1	
FREQ (HZ)	DISTANCE (M) -->	2	2	2	2	2	2	2	2	2	2	2	2
	ANGLE (DEG) -->	0	20	40	60	80	100	120	140	160	180	200	240
31.5		86	87	86	86	86	85	85	86	88	89	88	87
63		91	92	93	93	93	92	92	91	92	94	93	93
125		105	105	104	104	104	105	107	110	111	111	110	109
250		105	104	104	105	106	109	111	112	114	116	115	114
500		104	104	103	102	103	104	105	107	109	109	108	106
1000		103	101	98	98	100	99	99	104	109	113	108	102
2000		92	93	93	92	93	93	96	100	101	103	100	98
4000		97	98	98	93	94	94	95	99	99	101	98	97
8000		98	103	104	99	100	102	103	107	108	109	108	104
OVERALL		111	111	111	110	111	112	114	116	118	120	118	115

TABLE: MEASURED SOUND PRESSURE LEVEL (OB)													
OCTAVE BAND													
2	IDENTIFICATION:												
NOISE SOURCE/SUBJECT:													
HA-1A POWER UNIT, GAS													
TURBINE ENGINE													
(CONTINENTAL)													
NEAR FIELD NOISE LEVELS													
OPERATION:													
35,000 RPM (100%)													
LOADED (40 PSI)													
TEST 71-020-280													
RUN 02													
03 SEP 74													
PAGE J2													
FREQ (HZ)													
DISTANCE (M)-->													
ANGLE (DEG)-->													
31.5	87	87	85	86	86	92	1	1	1	1	1	1	1
63	92	92	93	91	91	99	99	99	100	102	102	103	104
125	107	108	106	105	105	110	109	110	110	109	112	114	116
250	109	109	108	106	105	109	107	108	110	111	111	114	116
500	104	103	102	102	103	106	108	108	103	109	112	114	116
1000	102	100	99	98	101	106	103	102	103	106	107	107	112
2000	94	92	92	93	92	93	95	97	96	98	100	104	107
4000	95	92	93	96	99	95	100	101	98	97	101	101	104
8000	102	98	98	99	99	98	102	106	104	104	108	110	113
OVERALL	113	112	111	110	111	114	114	115	115	116	118	120	122

[illegible]

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)		IDENTIFICATION:									
OCTAVE BAND											
2		OMEGA 3.2									
		TEST 71-020-280									
		RUN 04									
		03 SEP 74									
		PAGE J4									
NOISE SOURCE/SUBJECT:		OPERATION:									
HA-1A POWER UNIT, GAS											
TURBINE ENGINE		35,000 RPH (100%)									
(CONTINENTAL)		UNLOADED (0 PSI)									
NEAR FIELD NOISE LEVELS											
FREQ (HZ)	DISTANCE (M)--> ANGLE (DEG)-->	5		5		5		5		5	
		160	170	180	190	200	160	180	200	160	200
31.5		82	79	80	81	81	87	88	88		
63		88	88	88	88	89	93	93	93		
125		98	99	98	98	99	110	110	110		
250		102	101	102	101	102	115	115	115		
500		104	105	105	105	106	109	111	109		
1000		102	105	105	104	102	110	113	108		
2000		93	95	95	95	94	102	103	101		
4000		96	96	91	93	93	101	99	98		
8000		106	106	99	105	104	107	105	103		
OVERALL		110	111	110	111	110	118	119	118		

TABLE: MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3														OMEGA 3.2	
NOISE SOURCE/SUBJECT:														TEST 71-020-280	
HA-1A POWER UNIT, GAS														RUN 01	
TURBINE ENGINE														03 SEP 74	
(CONTINENTAL)														PAGE H1	
NEAR FIELD NOISE LEVELS															
DISTANCE (M)-->															
ANGLE (DEG)-->															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC															
OASLA															
T															
MINIMUM QPL EAR HUFFS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR HUFFS															
OASLA*															
T															
V-51R EAR PLUGS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR HUFFS PLUS V-51R EAR PLUGS															
OASLA*															
T															
H-133 GROUND COMMUNICATION UNIT															
OASLA*															
T															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL															
ANNOYANCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT															
C															

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.
P ADDITIONAL EAR PROTECTION REQUIRED.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE														IDENTIFICATION:	
3															
NOISE SOURCE/SUBJECT: (OPERATION:)														OMEGA 3.2	
HA-1A POWER UNIT, GAS (35,000 RPM (100%))														TEST 71-020-280	
TURBINE ENGINE (LOADED (40 PSI))														RUN 03	
(CONTINENTAL) ()														03 SEP 74	
NEAR FIELD NOISE LEVELS ()														PAGE H3	

DISTANCE (M)--> 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1														OPERATOR LOCATION	
ANGLE (DEG)--> 160 180 200 220 240 260 280 300 320 340														TEST CONDITION	
1/A															
HAZARD/PROTECTION															
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR															
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR															
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)															
NO PROTECTION															
OASLC															
OASLA															
T															
MINIMUM QPL EAR MUFFS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS															
OASLA*															
T															
V-51R EAR PLUGS															
OASLA*															
T															
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS															
OASLA*															
T															
H-133 GROUND COMMUNICATION UNIT															
OASLA*															
T															
COMMUNICATION															
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)															
PSIL															
ANNOUNCE															
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT IN PNDB)															
TONE CORRECTION (C IN DB)															
PNLT															
C															

* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.
P ADDITIONAL EAR PROTECTION REQUIRED.

TABLE: MEASURES OF HUMAN NOISE EXPOSURE										IDENTIFICATION:	
3											
NOISE SOURCE/SUBJECT: (OPERATION:)										OMEGA 3.2	
HA-1A POWER UNIT, GAS ((35,000 RPM (100%))										TEST 71-020-280	
TURBINE ENGINE ((UNLOADED (0 PSI))										RUN 04	
NEAR FIELD NOISE LEVELS (()										03 SEP 74	
										PAGE H4	
HAZARD/PROTECTION											
C-WEIGHTED OVERALL SOUND LEVEL (OASLC IN DB) AT EAR											
A-WEIGHTED OVERALL SOUND LEVEL (OASLA IN DB) AT EAR											
MAXIMUM PERMISSIBLE TIME (T IN MINUTES) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)											
NO PROTECTION											
OASLC	109	110	109	110	110	118	119	118			
OASLA	108	109	107	108	108	114	115	112			
T	8	6	9	8	8	2.7	2.2	3.8			
MINIMUM QPL EAR MUFFS											
OASLA*	86	87	85	86	86	95	95	94			
T	339	285	404	339	339	71	71	85			
AMERICAN OPTICAL 1700 EAR MUFFS											
OASLA*	81	82	80	82	82	90	90	90			
T	807	679	960	679	679	170	170	170			
V-51R EAR PLUGS											
OASLA*	83	84	84	84	83	90	92	89			
T	571	480	480	480	571	170	120	202			
AMERICAN OPTICAL 1700 EAR MUFFS PLUS V-51R EAR PLUGS											
OASLA*	77	71	70	71	69	76	78	75			
T	960	960	960	960	960	960	960	960			
H-133 GROUND COMMUNICATION UNIT											
OASLA*	79	81	79	80	79	87	88	86			
T	960	807	960	960	960	285	240	339			
COMMUNICATION											
PREFERRED SPEECH INTERFERENCE LEVEL (PSIL IN DB)											
PSIL	100	102	101	102	101	107	109	106			
ANNOUNCE											
PERCEIVED NOISE LEVEL, TONE CORRECTED (PNLT) IN PNDB)											
TONE CORRECTION (C IN DB)											
PNLT	121	123	118	122	122	123	128	126			
C	0	2	0	1	2	1	1	1			
* BASED ON CALCULATED SPL SPECTRUM UNDER PROTECTIVE DEVICE.											

TABLE: MEASURED SOUND PRESSURE LEVEL (08)																	IDENTIFICATION:	
(4																	() OMEGA 1.3	
() 1/3 OCTAVE BAND																	() TEST 71-020-280	
() DISTANCE = 5 METERS																	() RUN 01	
() NOISE SOURCE/SUBJECT:																	() METEOROLOGY:	
() HA-1A POWER UNIT, GAS																	() TEMP = 31 C	
() TURBINE ENGINE																	() BAR PRESS = .761 M HG	
() (CONTINENTAL)																	() REL HUMID = 63 %	
() FAR FIELD NOISE LEVELS																	() PAGE 2	
FREQ																	ANGLE (DEGREES)	
((

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

TABLE: MEASURED SOUND PRESSURE LEVEL (DB)																	IDENTIFICATION:	
1/3 OCTAVE BAND																		
DISTANCE = 5 METERS																	OMEGA 1.3	
4																	TEST 71-020-280	
																	RUN 02	
NOISE SOURCE/SUBJECT:																		
HA-1A POWER UNIT, GAS																	METEOROLOGY:	
TURBINE ENGINE																	TEMP = 31 C	
(CONTINENTAL)																	BAR PRESS = .761 M HG	
FAR FIELD NOISE LEVELS																	REL HUMID = 63 %	
																	PAGE 2	
FREQ																		
(HZ)																		
190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350																		
25 78 75< 80 76< 77 76< 80 74< 70< 71< 69< 71< 70< 71< 70< 70< 72<																		
31.5 81 76 77 77 77 76 77 77 75< 72< 74< 71< 74< 74< 75< 75<																		
40 80 79 79 80 79 78 79 78 77 77 76 77 77 77 78 78																		
50 80 82 82 82 80 80 81 80 79 79 80 80 80 81 81 80 81																		
63 84 84 84 84 84 82 84 82 82 81 82 81 82 83 82 82 84																		
80 85 84 85 85 85 84 85 84 85 85 85 85 86 85 86 87																		
100 88 82 82 88 88 88 88 87 88 87 88 87 87 88 87 88 89																		
125 96 95 94 94 93 93 93 92 92 93 91 92 89 88 89 89 89																		
160 98 97 96 96 93 93 92 92 92 93 93 92 91 90 89 88 87																		
200 97 96 95 94 94 92 91 89 89 89 90 90 90 89 89 89 89																		
250 95 95 94 94 94 91 91 89 88 87 87 87 87 88 89 90 92																		
315 97 97 96 95 96 94 94 92 91 90 89 90 90 90 92 94 94																		
400 99 100 98 97 95 95 93 92 92 91 90 90 92 94 93 93 95																		
500 103 103 101 101 99 97 95 93 93 93 93 93 94 94 95 95 92																		
630 99 97 95 93 91 90 91 91 90 89 88 88 88 89 90 93																		
800 98 96 92 91 89 88 90 89 89 88 87 86 85 87 89 91 92																		
1000 103 100 94 93 91 90 89 88 89 89 89 89 87 87 88 91																		
1250 96 95 94 93 92 90 88 86 88 88 86 87 86 87 87 87																		
1600 92 90 90 89 88 86 86 84 85 84 83 83 83 83 83 82																		
2000 89 90 88 89 88 86 85 83 83 83 82 82 83 82 82 82																		
2500 86 87 87 88 86 84 84 84 85 83 82 81 82 81 81 80																		
3150 85 88 88 86 84 84 84 85 83 82 81 80 81 81 82 81																		
4000 86 88 87 86 85 86 84 84 84 84 83 83 85 83 83 85 87																		
5000 89 90 87 88 86 86 85 85 85 84 85 85 89 87 88 91 95																		
6300 91 91 88 89 87 85 84 84 84 84 83 81 83 83 83 83																		
8000 96 96 93 94 91 90 88 88 88 86 84 86 86 87 87 86 86																		
10000 99 96 95 95 95 93 92 92 92 90 88 91 91 92 92 91 91																		
OVERALL 110 109 107 107 105 104 103 102 102 102 101 102 102 102 102 103 104																		
< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.																		

< LEVEL CORRECTED TO REMOVE BACKGROUND/ELECTRONIC NOISE.

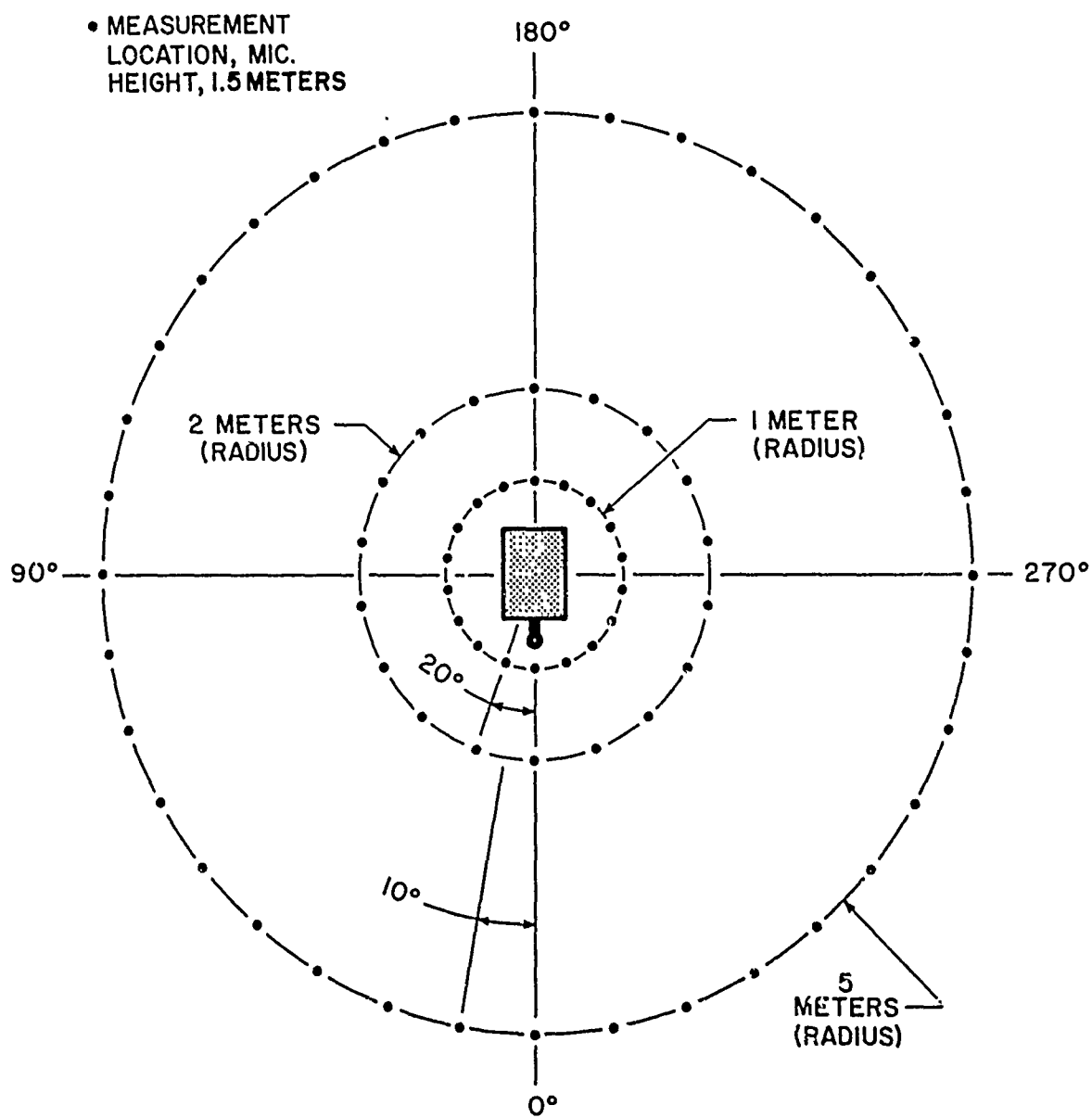


Figure 1. Measurement Locations

FIGURE 1: NORMALIZED FARFIELD NOISE LEVELS

2

DISTANCE = 10 METERS

NOISE SOURCE/SUBJECT: (OPERATION:)
 MA-1A POWER UNIT, GAS (35,000 RPM (100%))
 TURBINE ENGINE (LOADED (40 PSI))
 (CONTINENTAL) ()
 FAR FIELD NOISE LEVELS ()

IDENTIFICATION:

OMEGA 1.3
 TEST 71-020-280
 RUN 01
 13 FEB 75
 PAGE 4

METEOROLOGY: ()
 TEMP = 15 C
 BAR PRESS = .760 M HG
 REL HUMID = 70 %

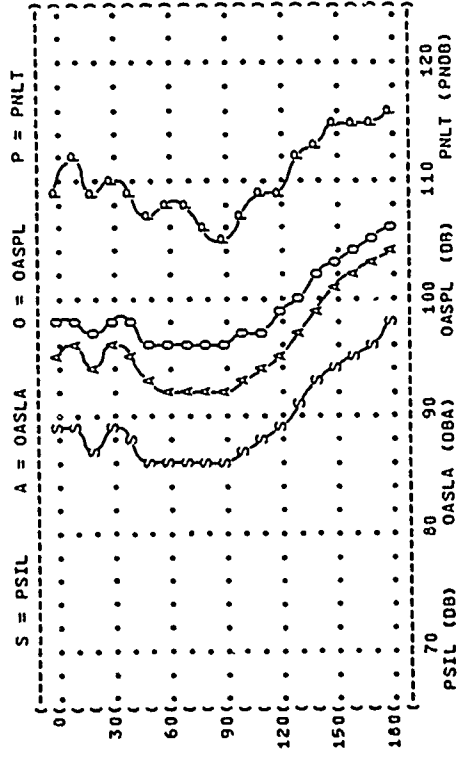
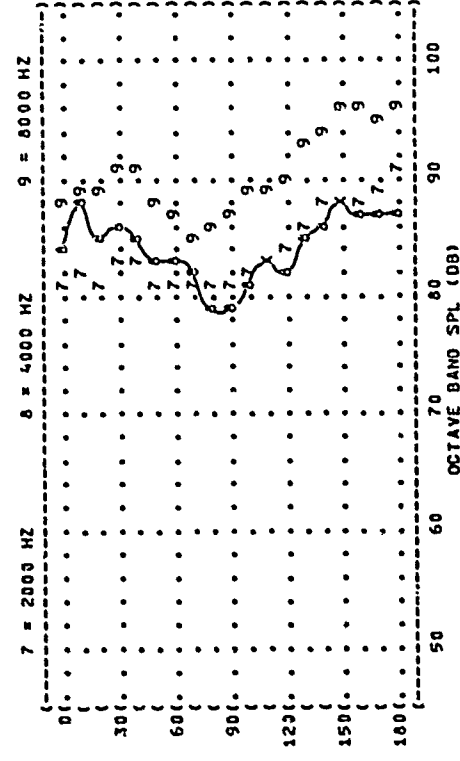
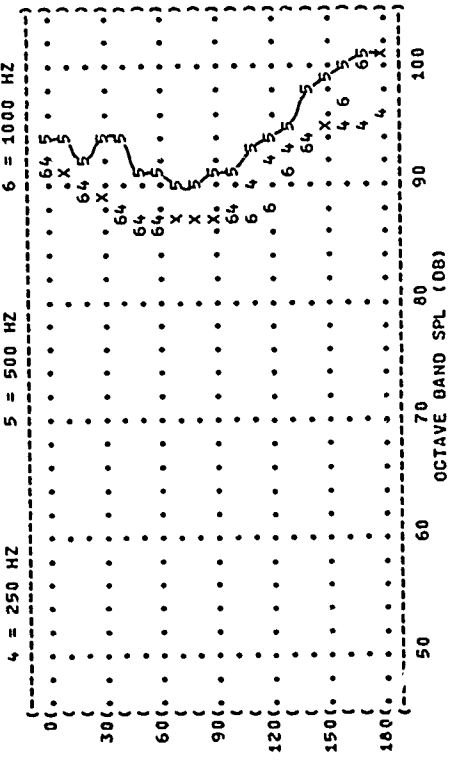
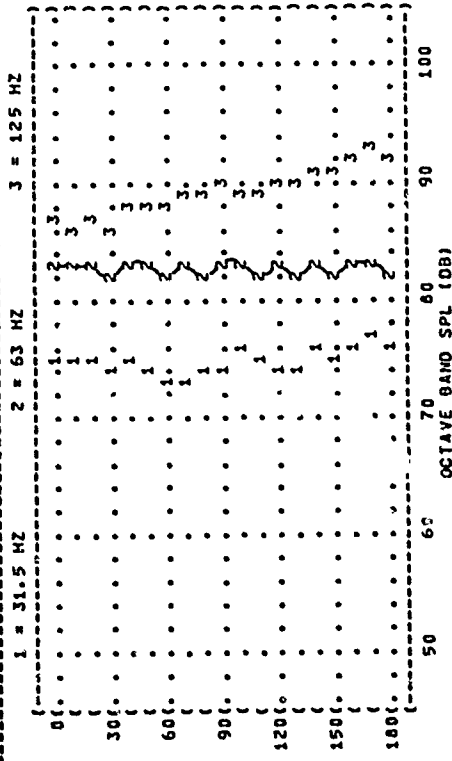


FIGURE 1 NORMALIZED FARFIELD NOISE LEVELS

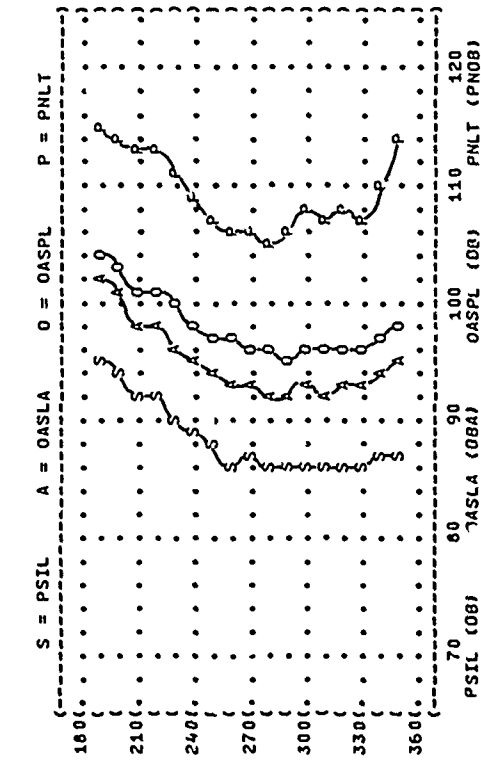
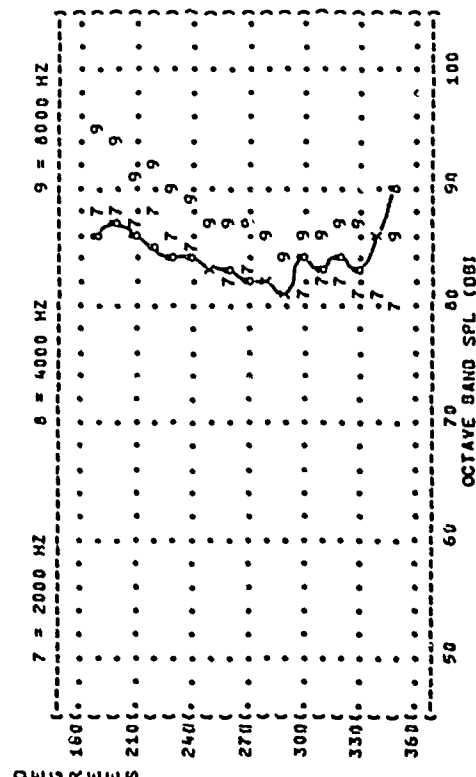
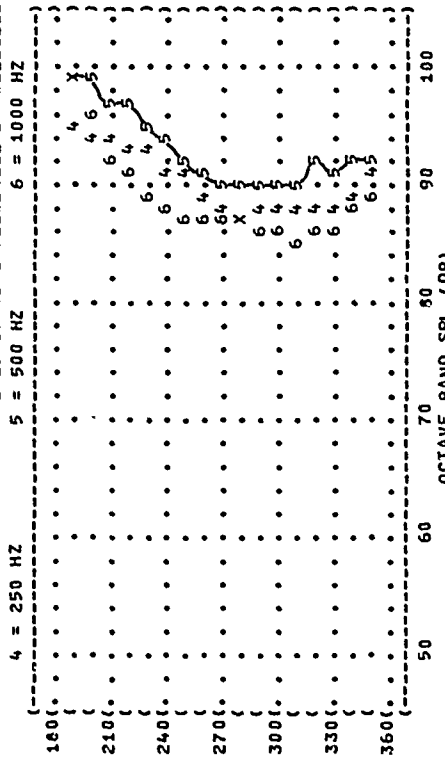
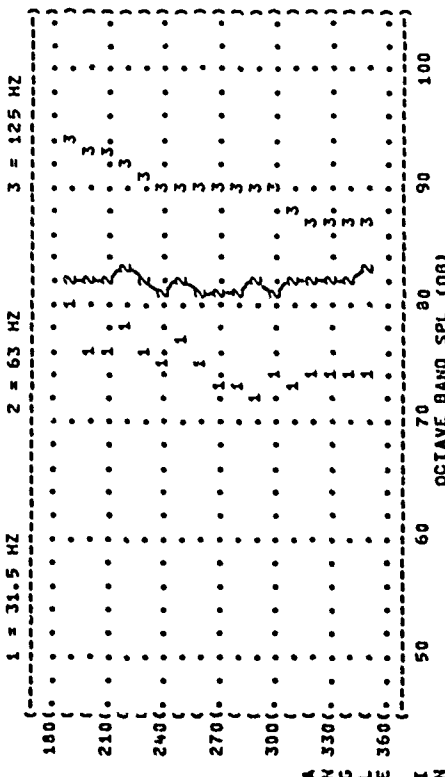
2 DISTANCE = 10 METERS

NOISE SOURCE/SUBJECT: MA-1A POWER UNIT, GAS TURBINE ENGINE (CONTINENTAL)

OPERATION: 35,000 RPM (100%) LOADED (40 PSI)

METEOROLOGY: TEMP = 15 C BAR PRESS = .760 M HG REL HUMID = 70 %

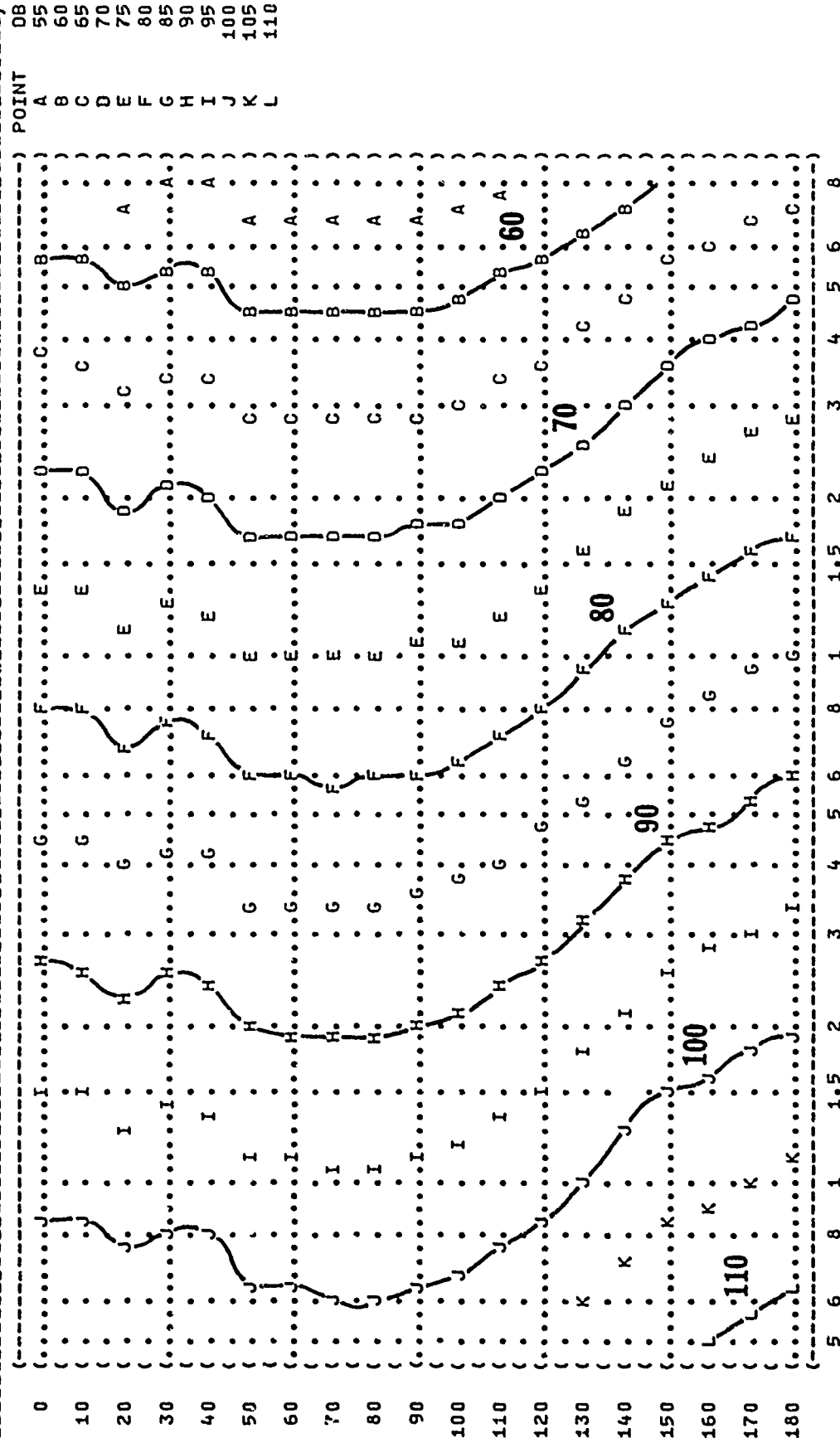
IDENTIFICATION: OMEGA 1.3 TEST 74-020-280 RUN 02 13 FEB 75 PAGE 4



IDENTIFICATION:

1.3

NOISE SOURCE/SUBJECT:	OPERATION:	METEOROLOGY:	RUN
HA-1A POWER UNIT, GAS		TEMP = 15 C	01
TURBINE ENGINE	35,000 RPM (100%)	BAR PRESS = .760 M HG	13 FEB 75
(CONTINENTAL)	LOADED (40 PSI)	REL HUMID = 70 %	
FAR FIELD NOISE LEVELS			PAGE 11



DISTANCE FROM SOURCE (METERS)

AZUL HZ BULGARIAN

(FIGURE: OVERALL SOUND PRESSURE LEVEL (OASPL))
 (3 EQUAL LEVEL CONTOURS (DB))
 () IDENTIFICATION:)
 () OMEGA 1.3)
 () TEST 71-020-280)
 () RUN 02)
 (NOISE SOURCE/SUBJECT: (OPERATION:) METEOROLOGY:)
 (HA-1A POWER UNIT, GAS () TEMP = 15 C)
 (TURBINE ENGINE (35,000 RPM (100%)) BAR PRESS = .760 M HG)
 ((CONTINENTAL) (LOADED (40 PSI)) REL HUMID = 70 %)
 (FAR FIELD NOISE LEVELS ())
 () PAGE 11)

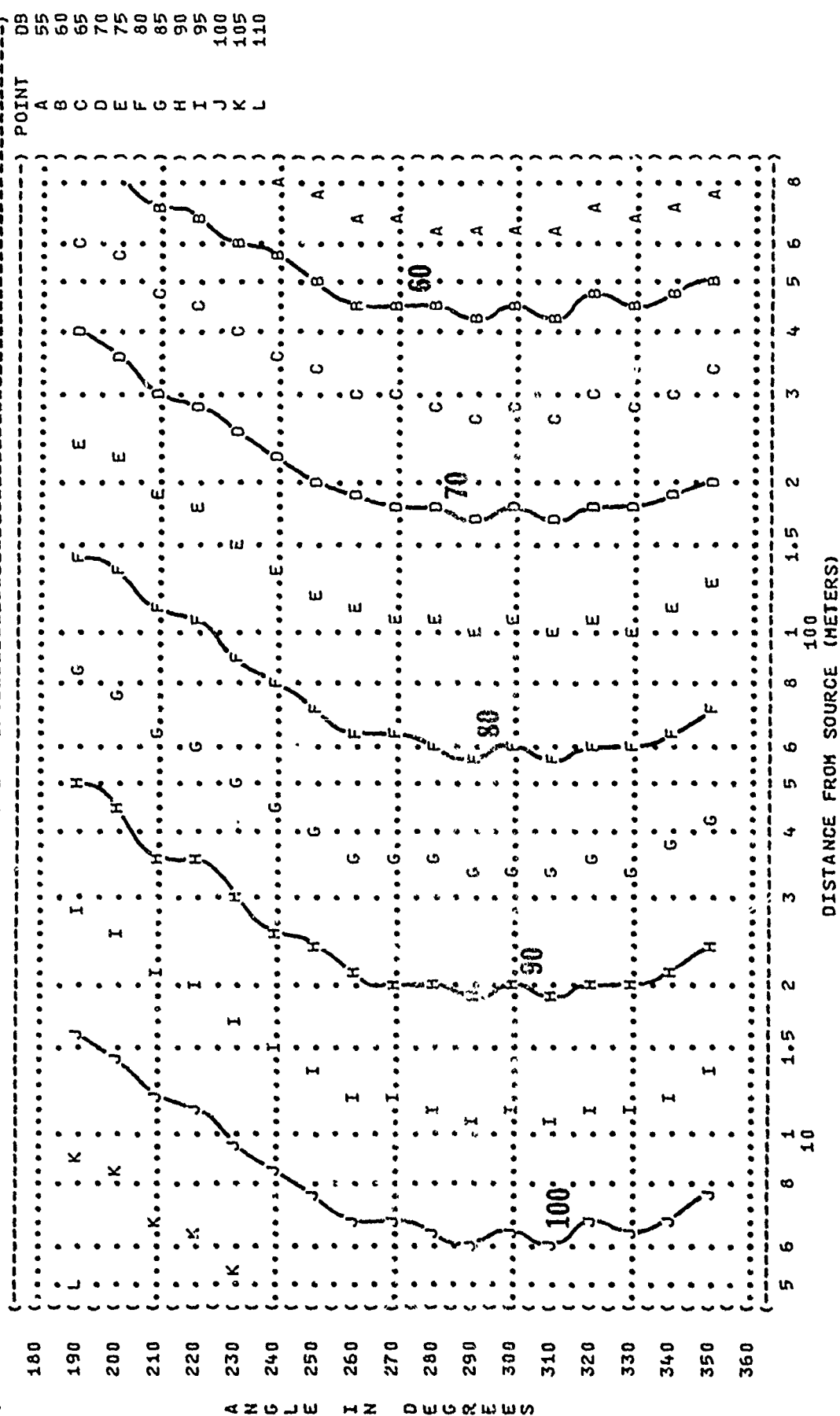
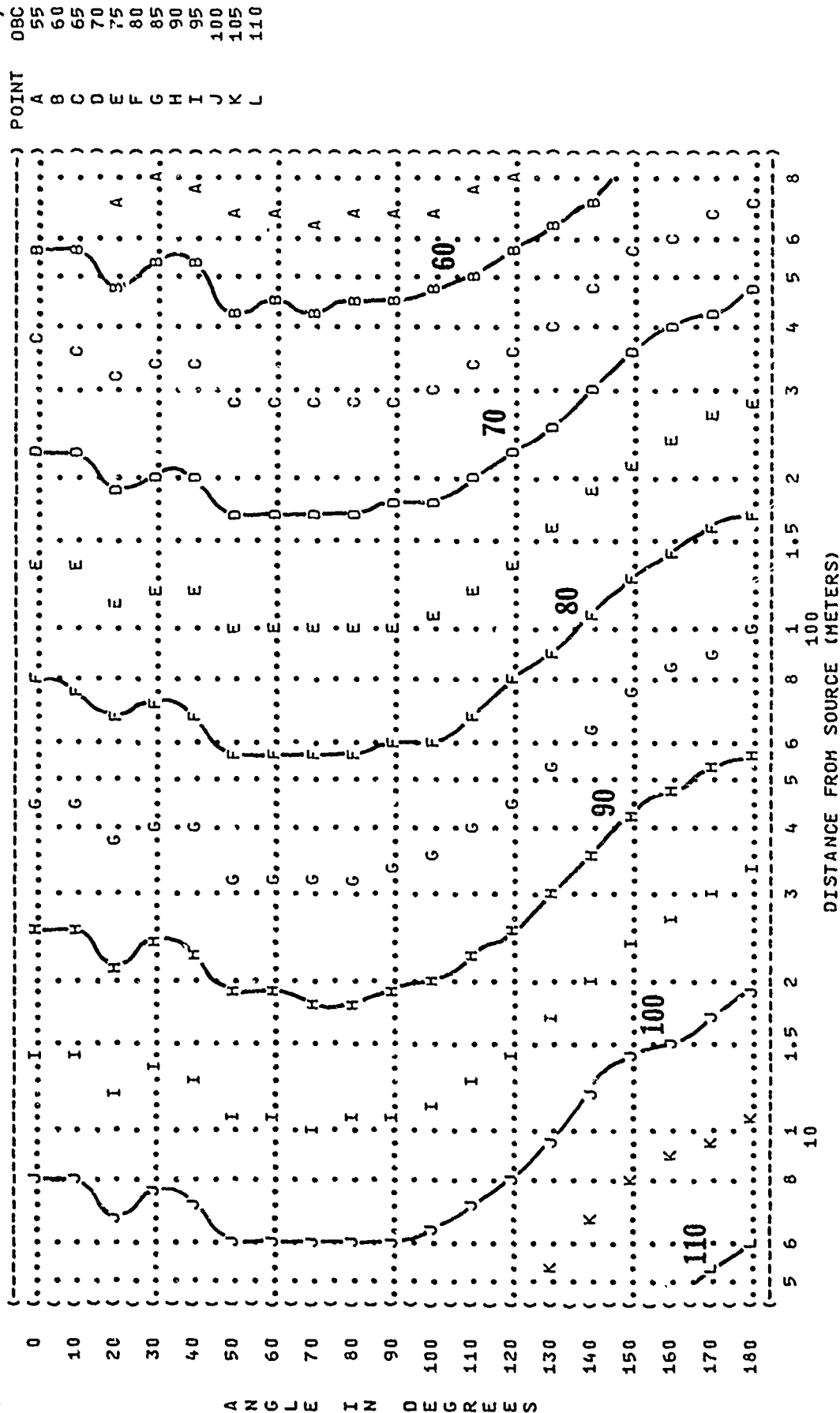


FIGURE: C-WEIGHTED OVERALL SOUND LEVEL (OASLC)	EQUAL LEVEL CONTOURS (OBC)	IDENTIFICATION:
4		
NOISE SOURCE/SUBJECT:	OPERATION:	METEOROLOGY:
HA-1A POWER UNIT, GAS		TEMP = 15 C
TURBINE ENGINE	35,000 RPM (100%)	BAR PRESS = .760 M HG
(CONTINENTAL)	LOADED (40 PSI)	REL HUMID = 70 %
FAR FIELD NOISE LEVELS		PAGE 12



IDENTIFICATION:

OMEGA 1.3

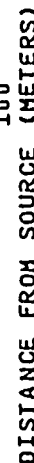
METEOROLOGY:

TEMP = 15 C

BAR PRESS = .760 H HG

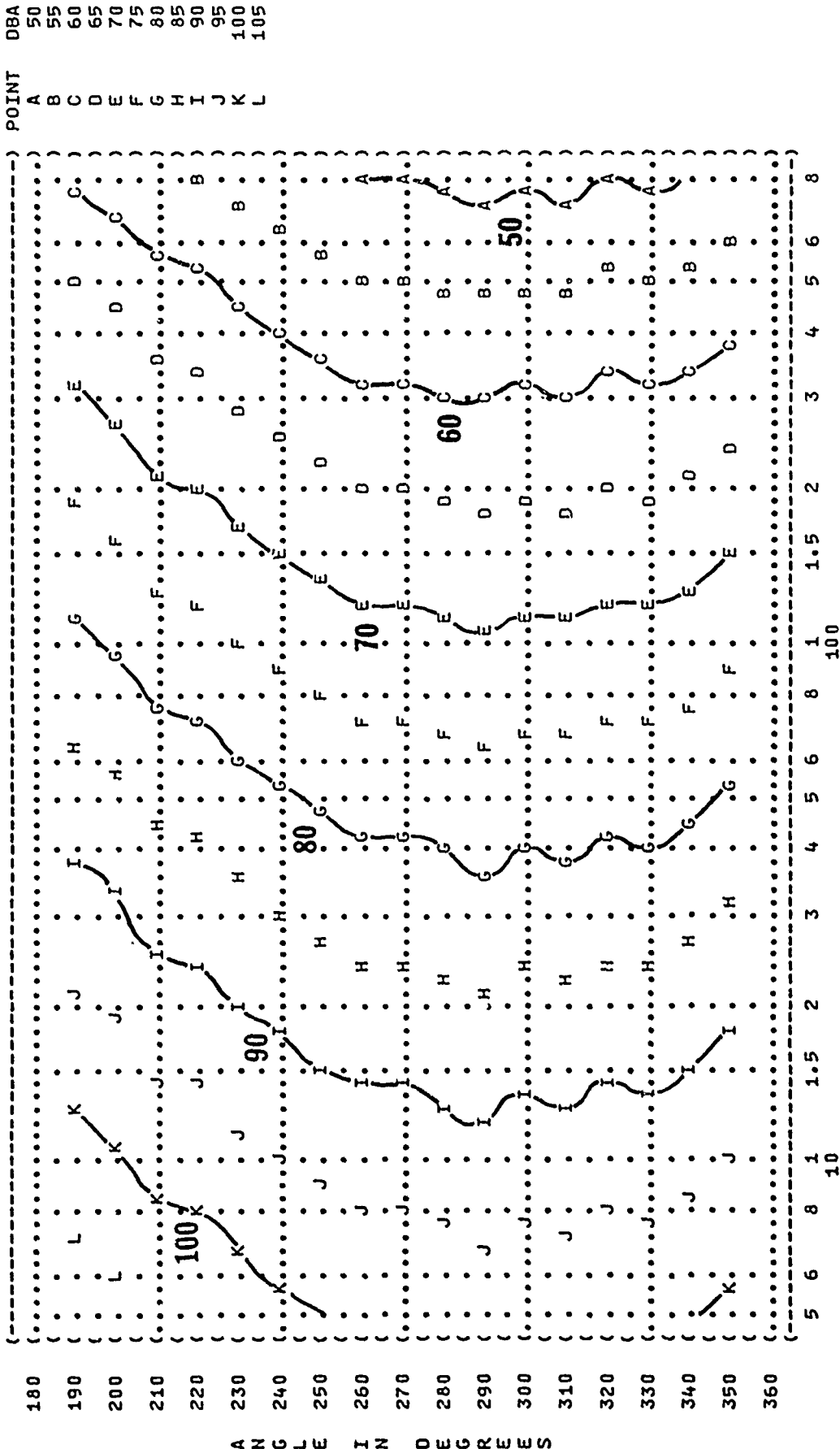
REL HUMID = 70 %

) PAGE 13



426 JW HZ 050455Z

(FIGURE: A-WEIGHTED OVERALL SOUND LEVEL (OASLA)
 (5
 (EQUAL LEVEL CONTOURS (DBA)
 () IDENTIFICATION:)
 () OMEGA 1.3
 () TEST 71-020-280
 () RUN 02
 ()
 (NOISE SOURCE/SUBJECT:) METEOROLOGY:)
 (HA-1A POWER UNIT, GAS) TEMP = 15 C
 (TURBINE ENGINE) BAR PRESS = .760 M HG
 ((CONTINENTAL)) LOADED (40 PSI)) REL HUMID = 70 %
 (FAR FIELD NOISE LEVELS))
 () PAGE 13)



A N G L E I N D E G R E E S


```
(-----)
( ( FIGURE: PERCEIVED NOISE LEVEL, TONE CORRECTED {PNLT})
( (
( ( EQUAL LEVEL CONTOURS (PNDB)
( (
(-----)
( ( NOISE SOURCE/SUBJECT: ( OPERATION: ) METEOROLOGY:
( ( HA-1A POWER UNIT, GAS ( TEMP = 15 C
( ( TURBINE ENGINE ( 35,000 RPH (100%) BAR PRESS = .760 M HG
( ( (CONTINENTAL) ( LOADED (40 PSI) REL HUMID = 70 %
( ( FAR FIELD NOISE LEVELS ( )
(-----)
( ( IDENTIFICATION: )
( ( )
( ( OMEGA 1.3
( ( TEST 71-020-280
( ( RUN 01
( ( 13 FEB 75
( ( PAGE 14
(-----)
```

) PAGE 14)
-----)

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31

FIGURE: PREFERRED SPEECH INTERFERENCE LEVEL (PSIL)
 7
 IDENTIFICATION:
 OMEGA 1.3
 TEST 71-020-280
 RUN 01
 13 FEB 75
 PAGE 15

METEOROLOGY:
 TEMP = 15 C
 BAR PRESS = .760 M HG
 REL HUMID = 70 %

NOISE SOURCE/SUBJECT: OPERATION:
 HA-1A POWER UNIT, GAS
 TURBINE ENGINE
 (CONTINENTAL)
 FAR FIELD NOISE LEVELS

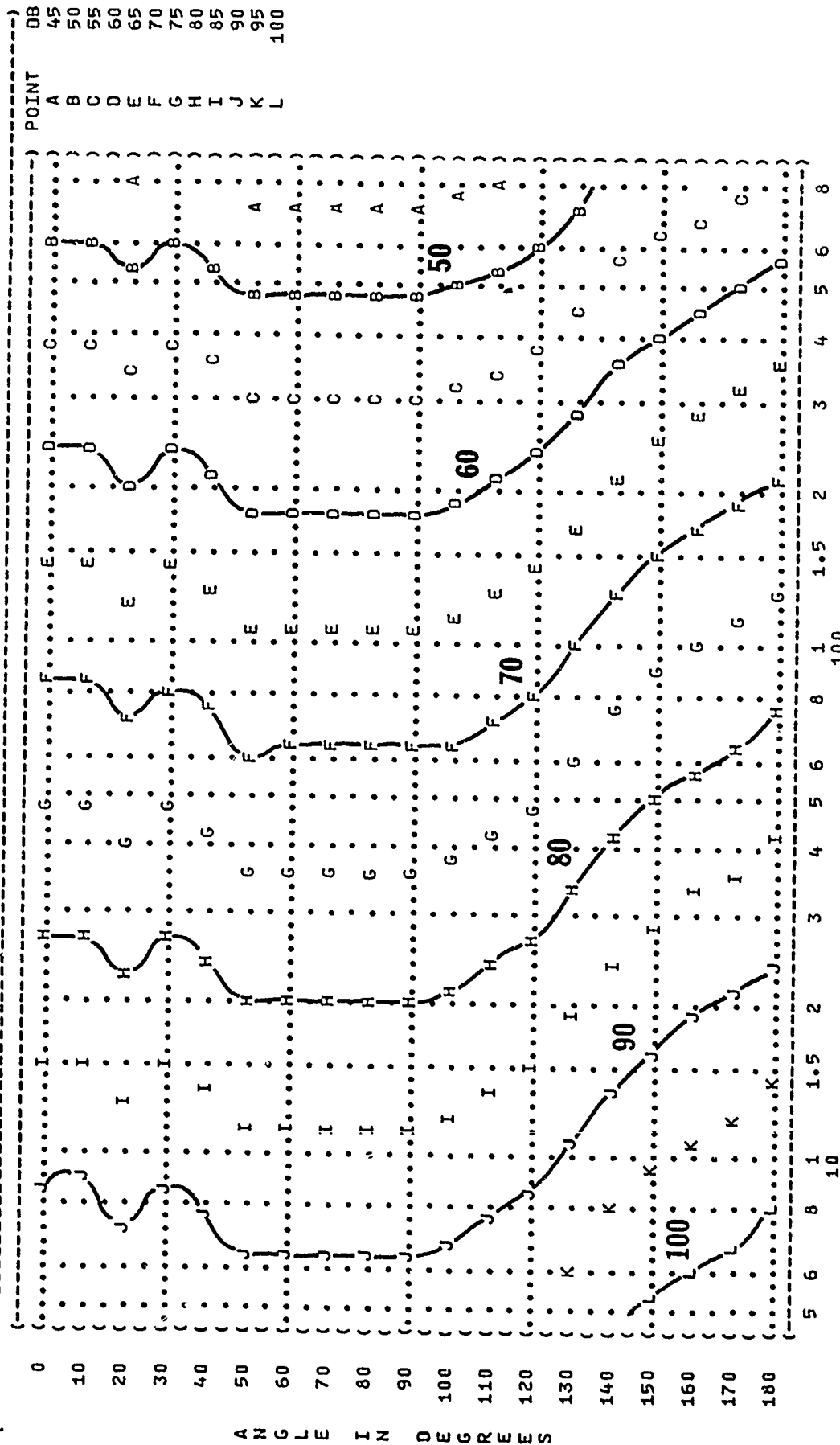


FIGURE 7. PREFERRED SPEECH INTERFERENCE LEVEL (PSIL) EQUAL LEVEL CONTOURS (DB)

7

```
( ( FIGURE: PREFERRED SPEECH INTERFERENCE LEVEL (PSIL) ) IDENTIFICATION: )
( ( EQUAL LEVEL CONTOURS (DB) ) ) )
( ( 7 ) ) )
( ( ) ) )
( ( NOISE SOURCE/SUBJECT: ) METEOROLOGY: )
( ( MA-1A POWER UNIT, GAS ) TEMP = 15 C )
( ( TURBINE ENGINE ) BAR PRESS = .760 M HG )
( ( (CONTINENTAL) ) REL HUMID = 70 % )
( ( FAR FIELD NOISE LEVELS ) ) )
( ( ) ) )
```

DB	POINT
45	A
50	B
55	C
60	D
65	E
70	F
75	G
80	H
85	I
90	J
95	K
100	L

180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360

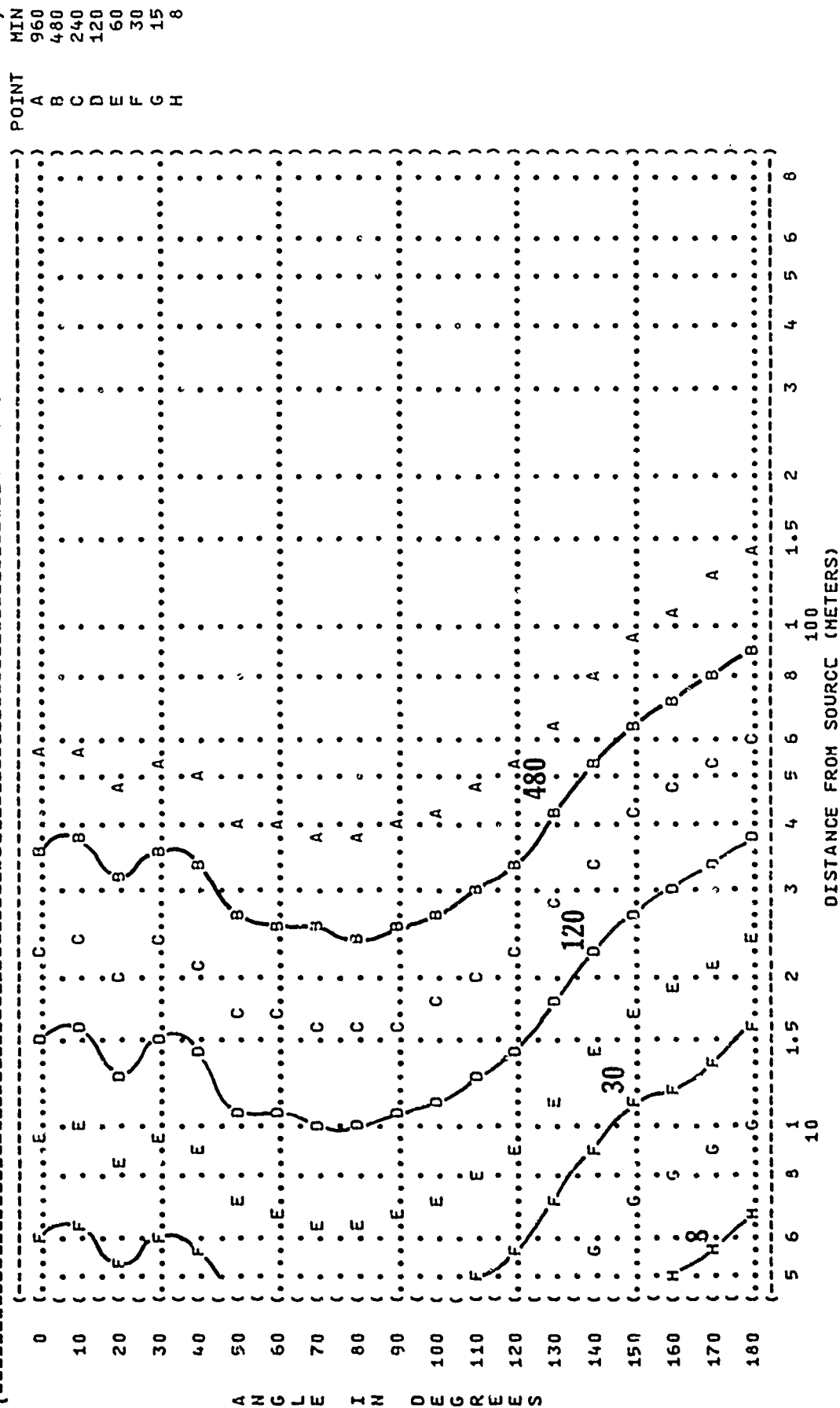
5 6 8 1 1.5 2 3 4 5 6 8 100 10

DISTANCE FROM SOURCE (METERS)

100 90 80 70 60 50

A B C D E F G H I J K L

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[illegible]

POINT	MIN	
	A	B
0	960	480
10		
20		
30		
40		
50		
60		
70		
80		
90		
100		
110		
120		
130		
140		
150		
160		
170		
180		

DISTANCE FROM SOURCE (METERS)

FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73) IDENTIFICATION:
 8 EQUAL TIME CONTOURS (MINUTES) OMEGA 1.3
 AMERICAN OPTICAL 1700 EAR MUFFS TEST 71-020-280
 NOISE SOURCE/SUBJECT: OPERATION: METEOROLOGY: TEMP = 15 C
 MA-1A POWER UNIT, GAS (35,000 RPM (100%) BAR PRESS = 760 M HG
 TURBINE ENGINE (LOADED (40 PSI) REL HUMID = 70 %
 (CONTINENTAL) (FAR FIELD NOISE LEVELS (PAGE 7

	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180
A
N
G
L
E
I
N
D
E
G
R
E
E
S

5 6 8 1 1.5 2 3 4 5 6 8 10
 100
 DISTANCE FROM SOURCE (METERS)

((FIGURE: MAXIMUM PERMISSIBLE TIME (T) FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73)) IDENTIFICATION:)
((EQUAL TIME CONTOURS (MINUTES)))
((AMERICAN OPTICAL 1700 EAR HUFFS) OMEGA 1.3)
((NOISE SOURCE/SUBJECT:) METEOROLOGY:) TEST 71-020-280)
((MA-1A POWER UNIT, GAS) TEMP = 15 C) RUN 02)
((TURBINE ENGINE) BAR PRESS = .760 M HG) 13 FEB 75)
(((CONTINENTAL)) LOADED (40 PSI)) REL HUMID = 70 %)
((FAR FIELD NOISE LEVELS)) PAGE 7)

[illegible]

100
TSTANCE FROM SOURCE (METERS)

```

(-----)
( ( FIGURE: MAXIMUM PERMISSIBLE TIME {1} FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73) ) IDENTIFICATION: )
( ( EQUAL TIME CONTOURS (MINUTES) ) )
( ( 8 ) )
( ( V-51R EAR PLUGS ) )
(-----)
( ( NOISE SOURCE/SUBJECT: ) )
( ( MA-1A POWER UNIT, GAS ) ) METEOROLOGY: )
( ( TURBINE ENGINE ) ) TEMP = 15 C )
( ( (CONTINENTAL) ) ) BAR PRESS = .760 M HG )
( ( FAR FIELD NOISE LEVELS ) ) REL HUMID = 70 % )
( ( ) ) )
(-----)
( ( PAGE 8 ) )
(-----)

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[illegible]

DISTANCE FROM SOURCE (METERS)

POINT	MIN
A	960
B	480

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11

180

ANGLER IN DEGREE

41

DISTANCE FROM SOURCE (METERS)

POINT	MIN
A	960
B	480
C	240

STATION	TIME CONTOURS (MINUTES)
1	10
2	20
3	30
4	40
5	50
6	60
7	70
8	80
9	90
10	100
11	110
12	120
13	130
14	140
15	150
16	160
17	170
18	180
19	190
20	200
21	210
22	220
23	230
24	240
25	250
26	260
27	270
28	280
29	290
30	300
31	310
32	320
33	330
34	340
35	350
36	360
37	370
38	380
39	390
40	400
41	410
42	420
43	430
44	440
45	450
46	460
47	470
48	480
49	490
50	500
51	510
52	520
53	530
54	540
55	550
56	560
57	570
58	580
59	590
60	600
61	610
62	620
63	630
64	640
65	650
66	660
67	670
68	680
69	690
70	700
71	710
72	720
73	730
74	740
75	750
76	760
77	770
78	780
79	790
80	800
81	810
82	820
83	830
84	840
85	850
86	860
87	870
88	880
89	890
90	900
91	910
92	920
93	930
94	940
95	950
96	960
97	970
98	980
99	990
100	1000

COMFIT TRIPLE FLANGE EAR PLUGS

SOURCE/SUBJECT:

A POWER UNIT, GAS

INE ENGINE (35,000 RPM (100%)

CONTINENTAL)
(LOADED (40 PSI)

STATION NOISE LEVELS

METEOROLOGY:

TEMP

BAR PRESS = .760 M HG

REL HUMID = 70 %

PAGE 9

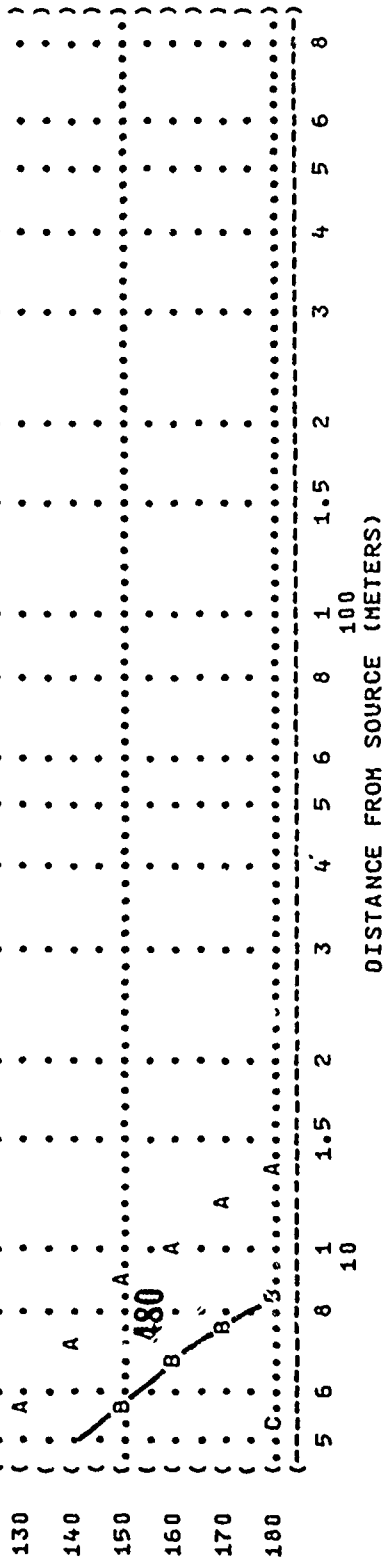
POINT

A

6

420 JW HZ 0504555

42



[illegible]

3 4 5 6 8 100
DISTANCE FROM SOURCE (METERS)

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( ( FIGURE: MAXIMUM PERMISSIBLE TIME {} FOR ONE EXPOSURE PER DAY (AFR 161-35, JULY 73) ) IDENTIFICATION: )
( ( 8 EQUAL TIME CONTOURS (MINUTES) ) )
( ( H-133 GROUND COMMUNICATION UNIT ) OMEGA 1.3 )
( ( ) ) TEST 71-020-280 )
( ( NOISE SOURCE/SUBJECT: ) OPERATION: ) METEOROLOGY: ) RUN 01 )
( ( HA-1A POWER UNIT, GAS ) ) TEMP = 15 C ) )
( ( TURBINE ENGINE ) 35,000 RPM (100%) ) BAR PRESS = .760 M HG ) 13 FEB 75 )
( ( (CONTINENTAL) ) LOADED (40 PSI) ) REL HUMID = 70 % ) )
( ( FAR FIELD NOISE LEVELS ) ) ) ) PAGE 10 )

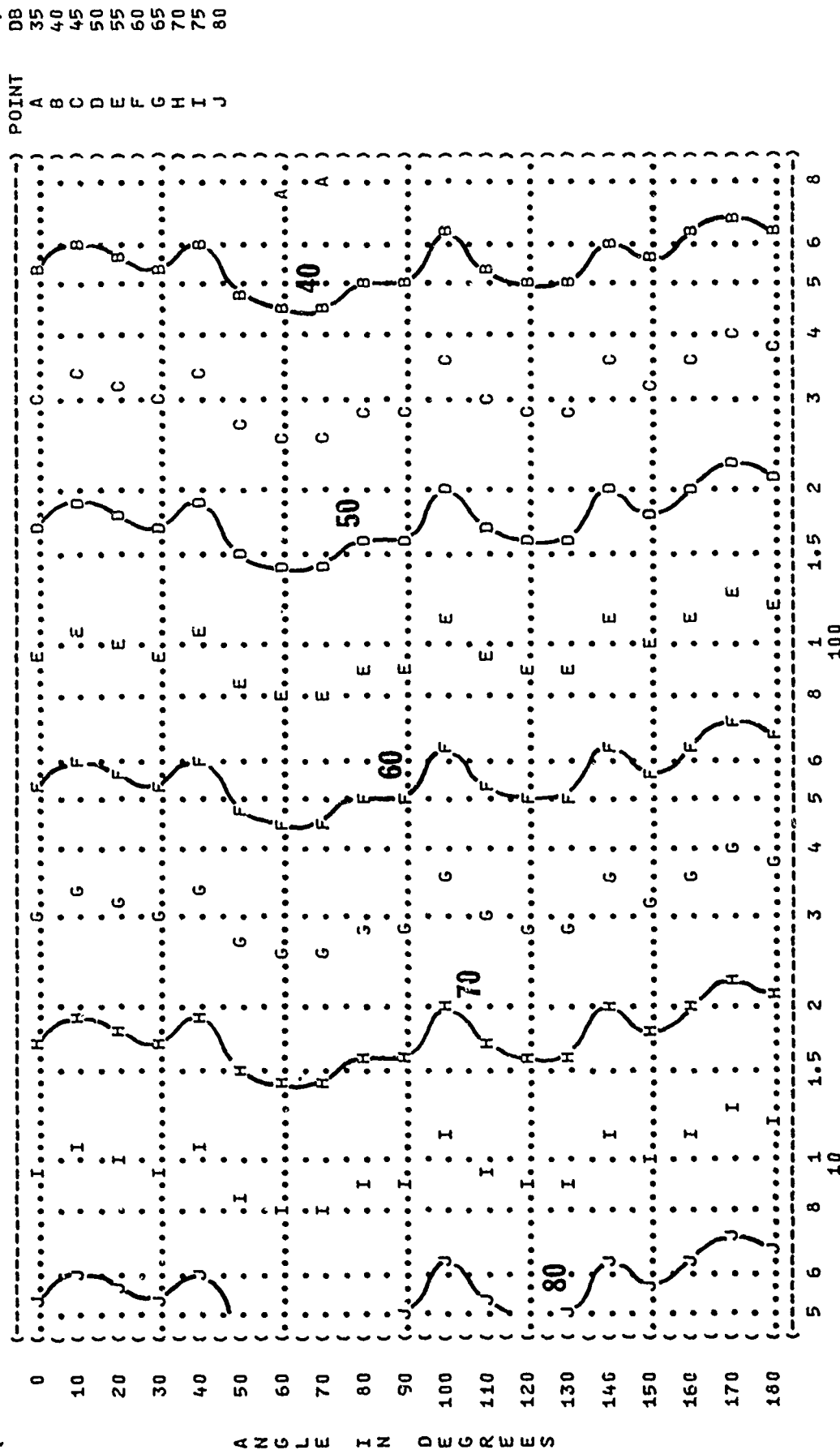
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	POINT A										POINT B										POINT C										POINT D										POINT E										POINT F										POINT G										POINT H										POINT I										POINT J										POINT K										POINT L										POINT M										POINT N										POINT O										POINT P										POINT Q										POINT R										POINT S										POINT T										POINT U										POINT V										POINT W										POINT X										POINT Y										POINT Z										POINT AA										POINT AB										POINT AC										POINT AD										POINT AE										POINT AF										POINT AG										POINT AH										POINT AI										POINT AJ										POINT AK										POINT AL										POINT AM										POINT AN										POINT AO										POINT AP										POINT AQ										POINT AR										POINT AS										POINT AT										POINT AU										POINT AV										POINT AW										POINT AX										POINT AY										POINT AZ										POINT BA										POINT BB										POINT BC										POINT BD										POINT BE										POINT BF										POINT BG										POINT BH										POINT BI										POINT BJ										POINT BK										POINT BL										POINT BM										POINT BN										POINT BO										POINT BP										POINT BQ										POINT BR										POINT BS										POINT BT										POINT BU										POINT BV										POINT BW										POINT BX										POINT BY										POINT BZ										POINT CA										POINT CB										POINT CC										POINT CD										POINT CE										POINT CF										POINT CG										POINT CH										POINT CI										POINT CJ										POINT CK										POINT CL										POINT CM										POINT CN										POINT CO										POINT CP										POINT CQ										POINT CR										POINT CS										POINT CT										POINT CU										POINT CV										POINT CW										POINT CX										POINT CY										POINT CZ										POINT DA										POINT DB										POINT DC										POINT DD										POINT DE										POINT DF										POINT DG										POINT 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FK										POINT FL										POINT FM										POINT FN										POINT FO										POINT FP										POINT FQ										POINT FR										POINT FS										POINT FT										POINT FU										POINT FV										POINT FW										POINT FX										POINT FY										POINT FZ										POINT GA										POINT GB										POINT GC										POINT GD										POINT GE										POINT GF										POINT GG										POINT GH										POINT GI										POINT GJ										POINT GK										POINT GL										POINT GM										POINT GN										POINT GO										POINT GP										POINT GQ										POINT GR										POINT GS										POINT GT										POINT GU										POINT GV										POINT GW										POINT GX										POINT GY										POINT GZ										POINT HA										POINT HB										POINT HC										POINT HD										POINT HE										POINT HF										POINT HG										POINT HH										POINT HI										POINT HJ										POINT HK										POINT HL										POINT HM										POINT 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JQ										POINT JR										POINT JS										POINT JT										POINT JU										POINT JV										POINT JW										POINT JX										POINT JY										POINT JZ										POINT KA										POINT KB										POINT KC										POINT KD										POINT KE										POINT KF										POINT KG										POINT KH										POINT KI										POINT KJ										POINT KK										POINT KL										POINT KM										POINT KN										POINT KO										POINT KP										POINT KQ										POINT KR										POINT KS										POINT KT										POINT KU										POINT KV										POINT KW										POINT KX										POINT KY										POINT KZ										POINT LA										POINT LB										POINT LC										POINT LD										POINT LE										POINT LF										POINT LG										POINT LH										POINT LI										POINT LJ										POINT LK										POINT LL										POINT LM										POINT LN										POINT LO										POINT LP										POINT LQ										POINT LR										POINT LS										POINT 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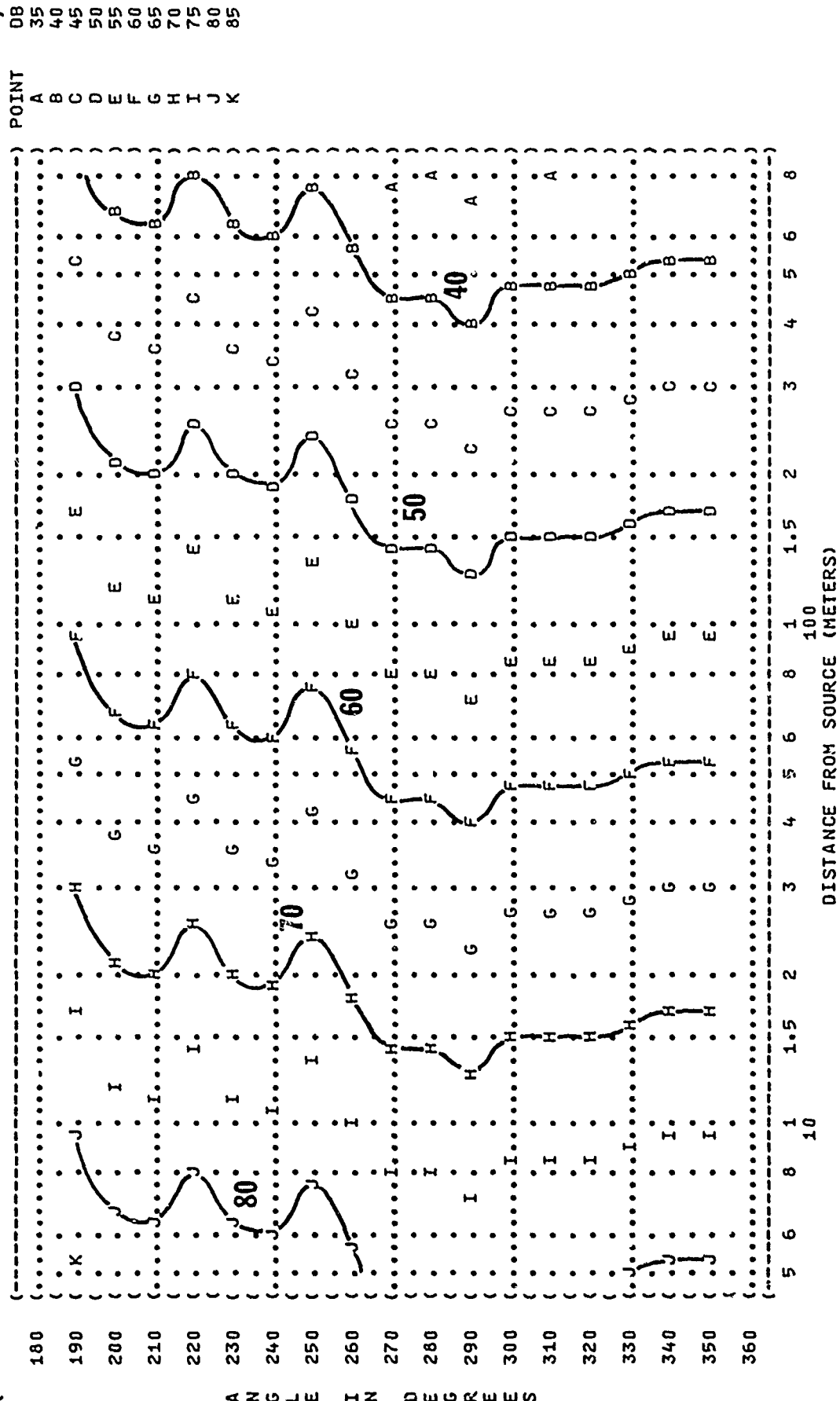
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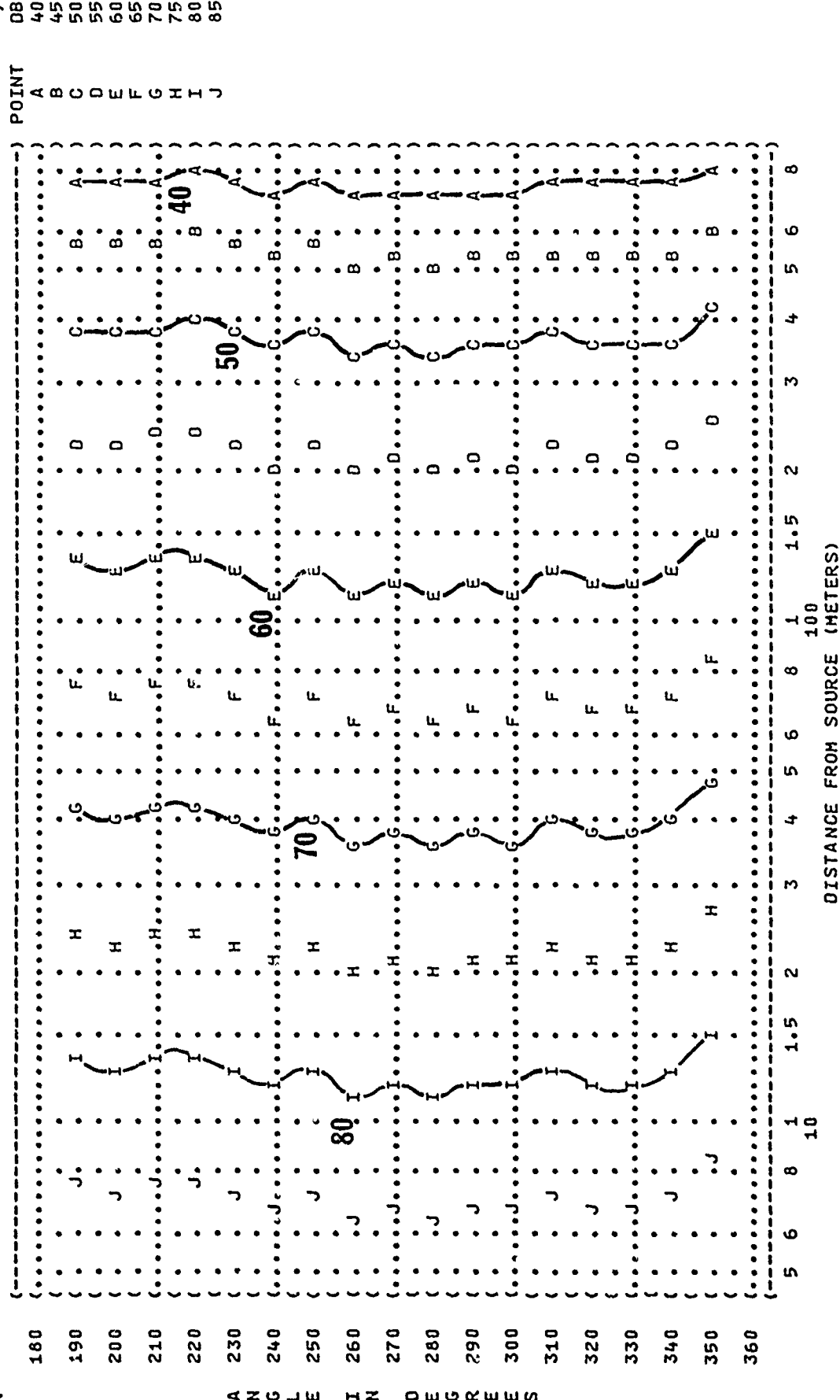
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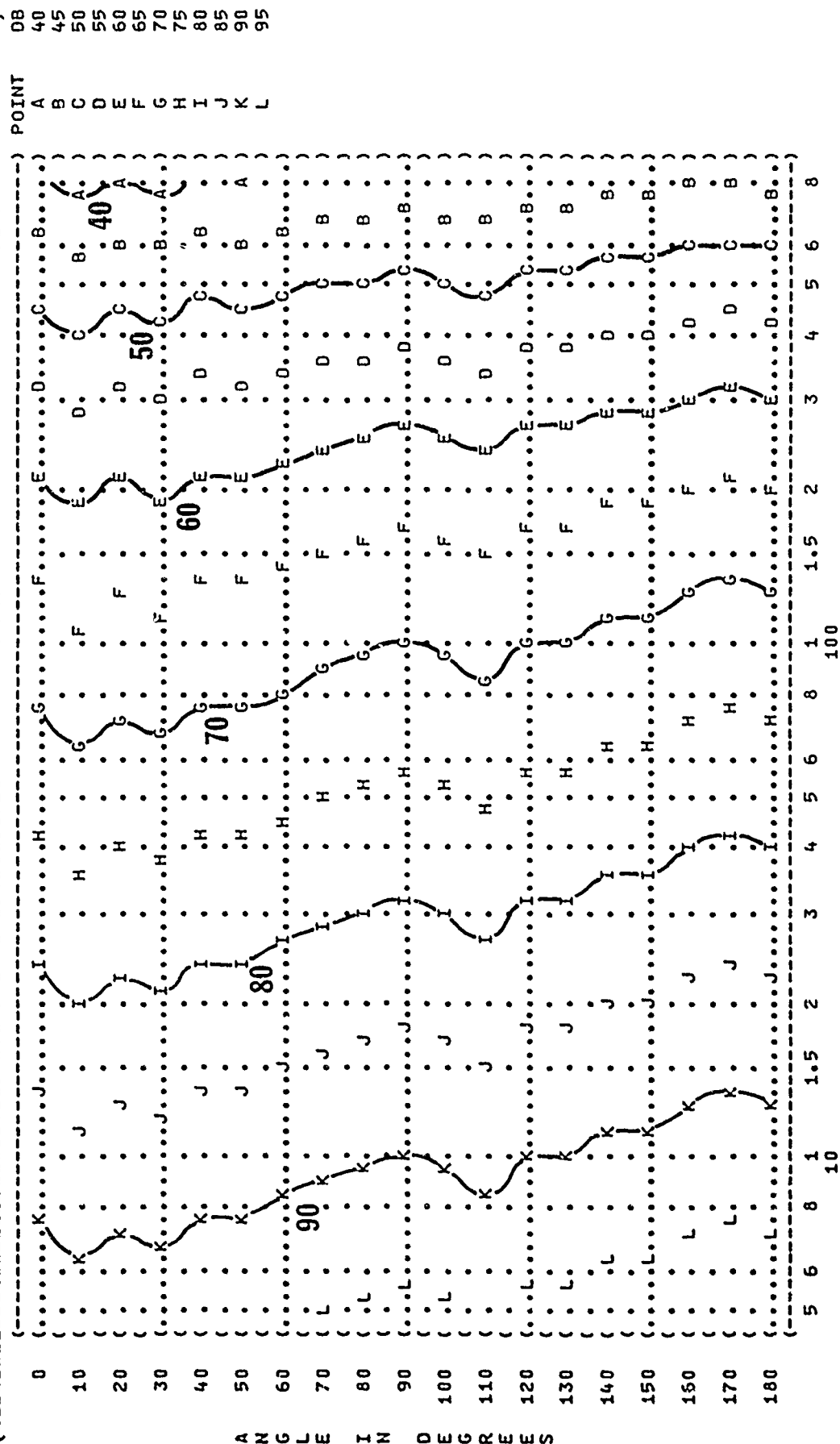


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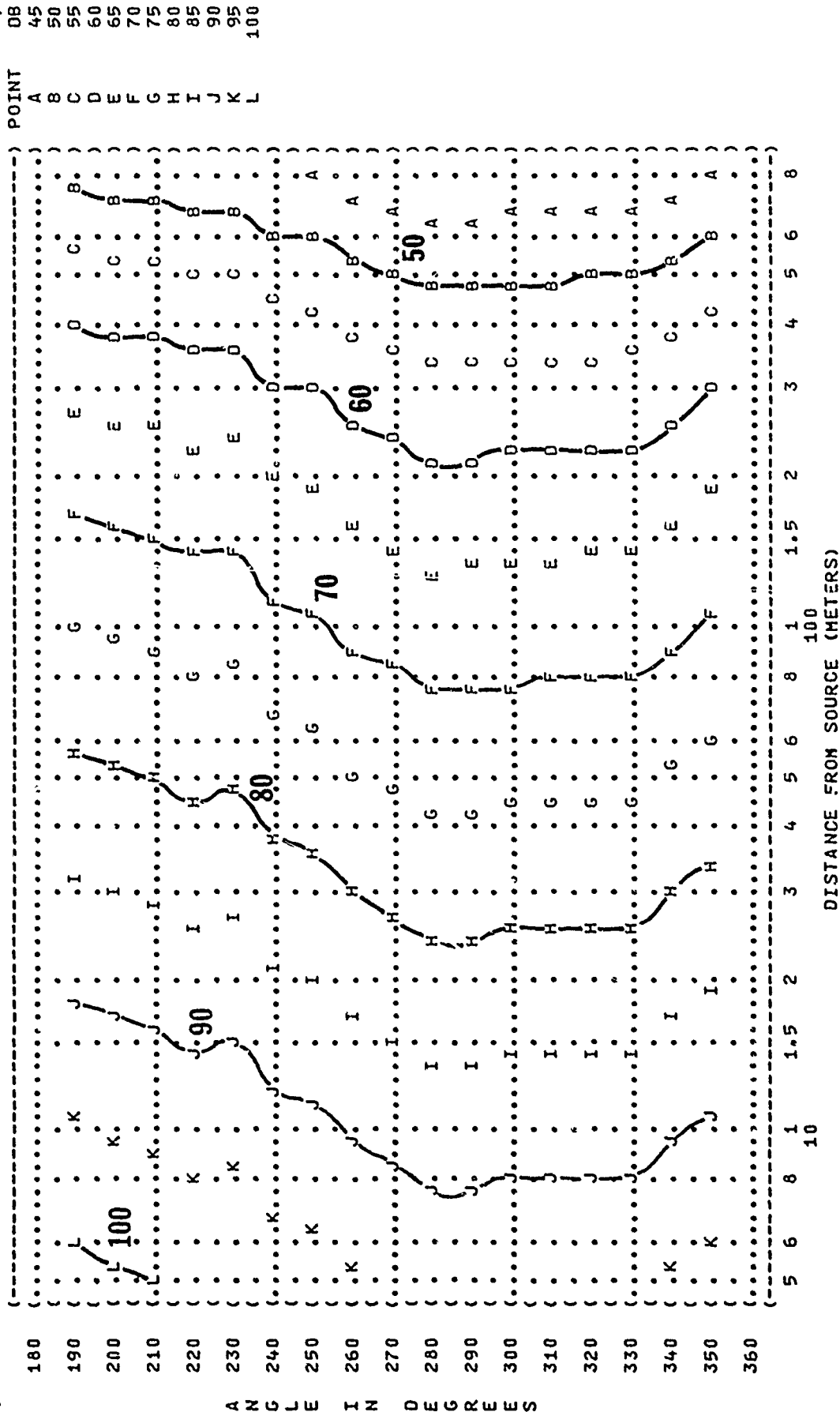
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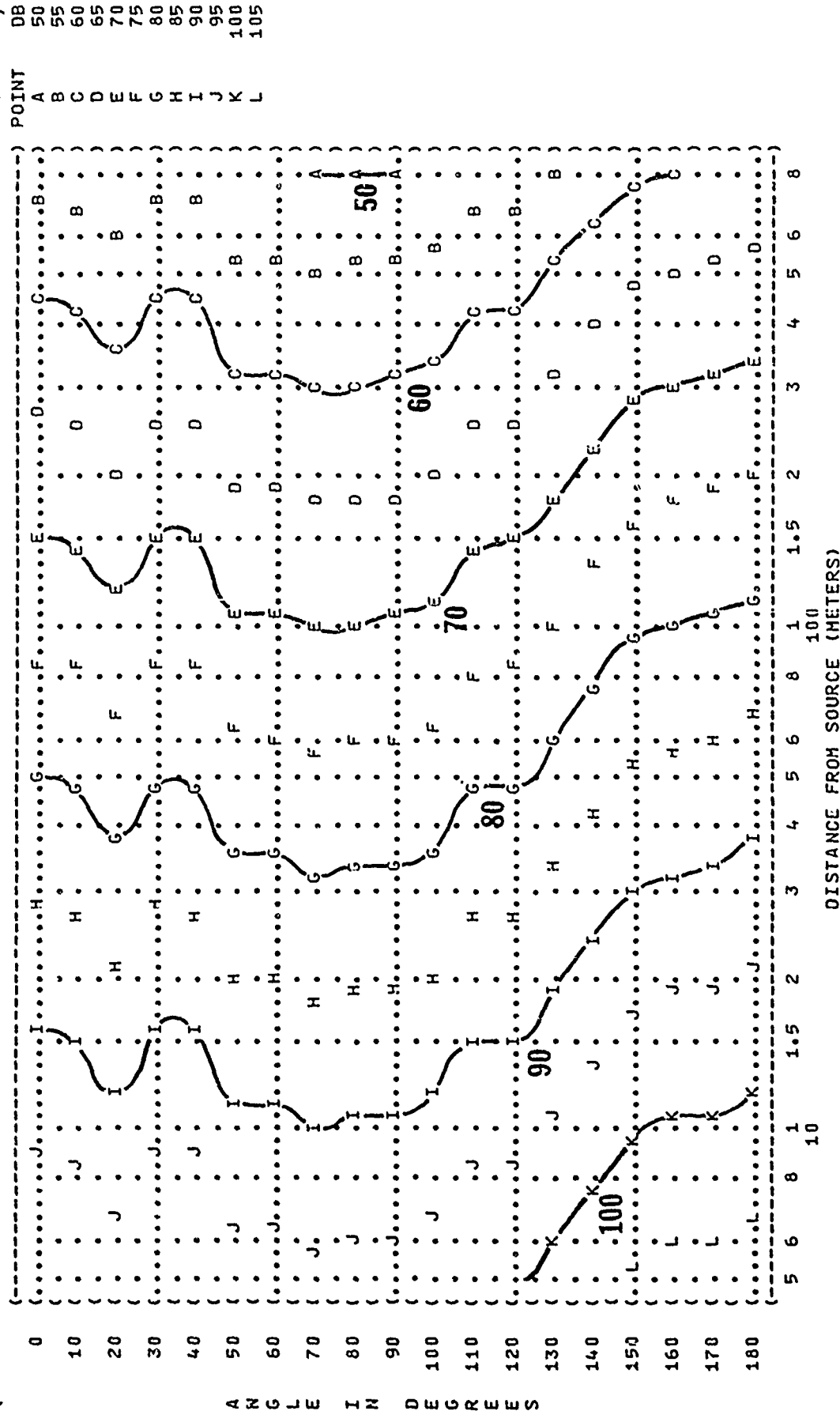

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( (CONTINENTAL) ) REL HUMID = 70 % )
( FAR FIELD NOISE LEVELS ) )
{-----}
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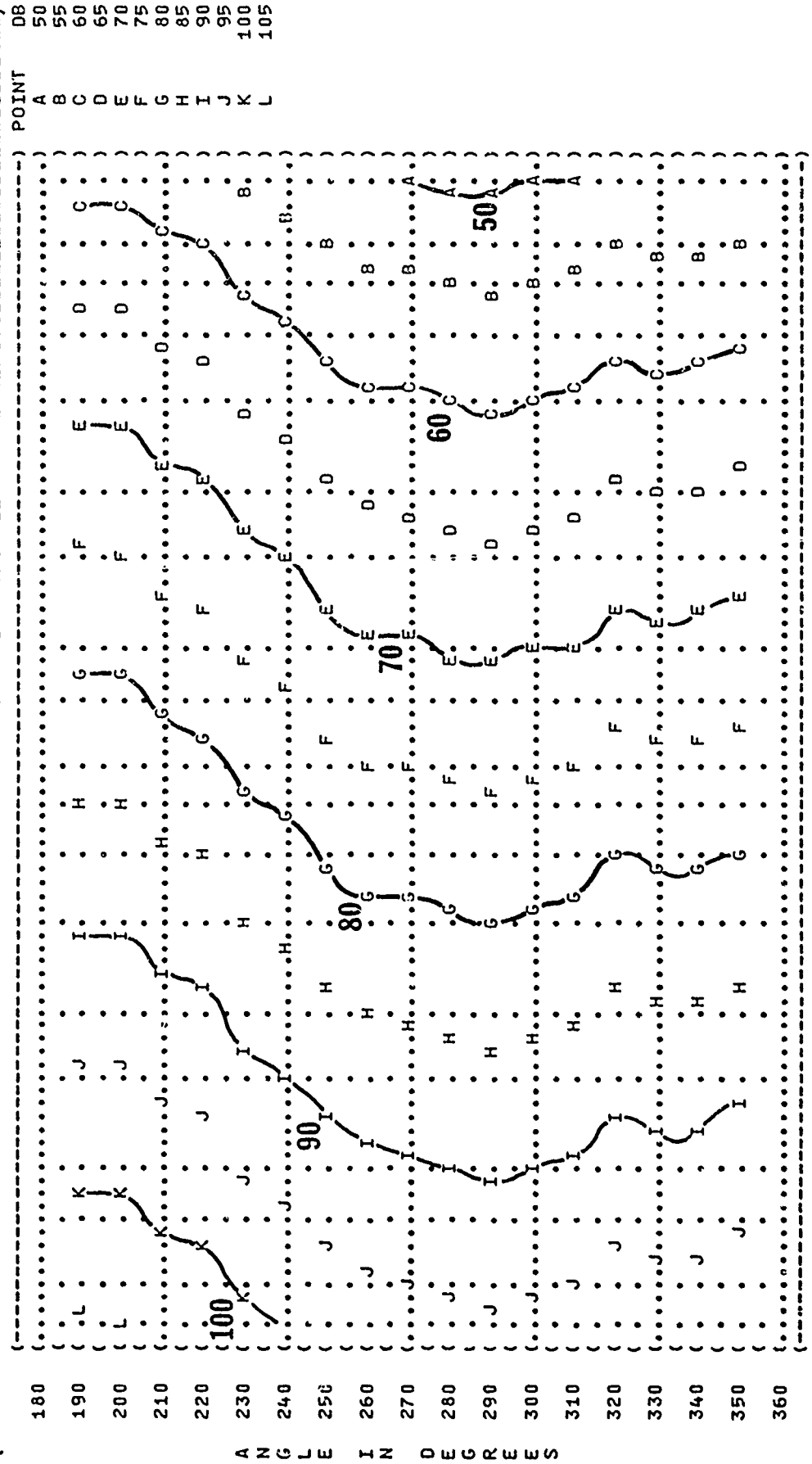
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(-----)
( ( FIGURE: SOUND PRESSURE LEVEL (SPL) ) ) IDENTIFICATION: )
( ( EQUAL LEVEL CONTOURS (DB) ) ) )
( ( 9 ) ) )
( ( 500 HZ OCTAVE BAND ) ) )
(-----)
( ( NOISE SOURCE/SUBJECT: ) ) )
( ( HA-1A POWER UNIT, GAS ) ) )
( ( TURBINE ENGINE ) ) )
( ( (CONTINENTAL) ) ) )
( ( FAR FIELD NOISE LEVELS ) ) )
( ( 35,000 RPM (100%) ) ) )
( ( LOADED (40 PSI) ) ) )
( ( BAR PRESS = .760 M HG ) ) )
( ( REL HUMID = 70 % ) ) )
( ( TEMP = 15 C ) ) )
( ( METEOROLOGY: ) ) )
(-----)
( ( TEST 71-020-280 ) ) )
( ( RUN 01 ) ) )
( ( OMEGA 1.3 ) ) )
( ( IDENTIFICATION: ) ) )
(-----)

```

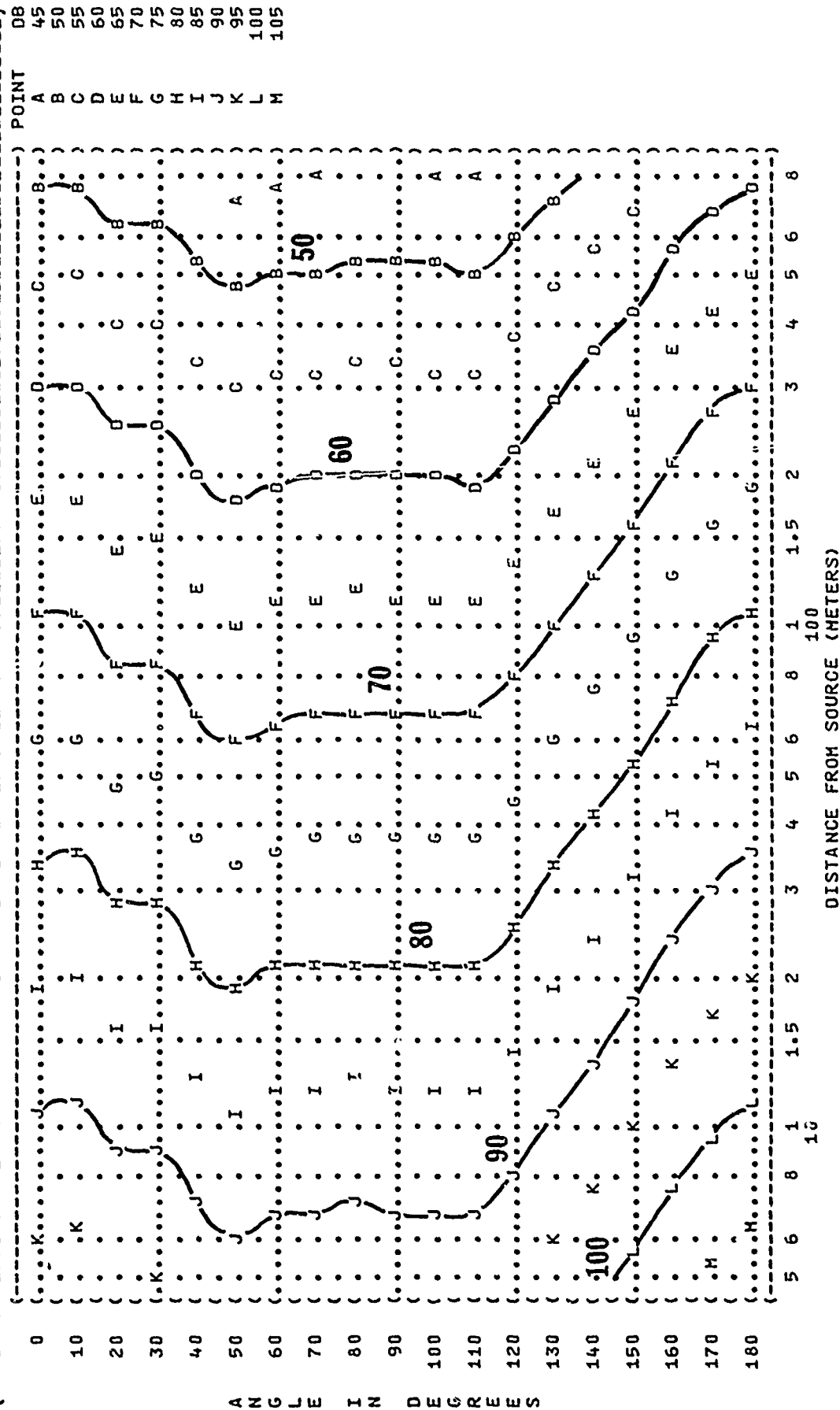


(FIGURE: SOUND PRESSURE LEVEL (SPL))
 (9 EQUAL LEVEL CONTOURS (DB))
 (500 HZ OCTAVE BAND)
 (NOISE SOURCE/SUBJECT:)
 (HA-1A POWER UNIT, GAS)
 (TURBINE ENGINE)
 ((CONTINENTAL))
 (FAR FIELD NOISE LEVELS)
 (OPERATION:)
 (35,000 RPM (100%))
 (LOADED (40 PSI))
 (METEOROLOGY:)
 (TEMP = 15 C)
 (BAR PRESS = .760 M HG)
 (REL HUMID = 70 %)
 (IDENTIFICATION:)
 (OMEGA 1.3)
 (TEST 71-020-280)
 (RUN 02)
 (13 FEB 75)
 (PAGE 20)



A N G L E I N D E G R E E S

(FIGURE: SOUND PRESSURE LEVEL (SPL))
 (EQUAL LEVEL CONTOURS (DB))
 (9 1000 HZ OCTAVE BAND)
 (NOISE SOURCE/SUBJECT:)
 (HA-1A POWER UNIT, GAS)
 (TURBINE ENGINE)
 ((CONTINENTAL))
 (FAR FIELD NOISE LEVELS)
 (OPERATION:)
 (35,000 RPM (100%))
 (LOADED (40 PSI))
 (METEOROLOGY:)
 (TEMP = 15 C)
 (BAR PRESS = .760 M HG)
 (REL HUMID = 70 %)
 (IDENTIFICATION:)
 (OMEGA 1.3)
 (TEST 71-020-280)
 (RJN 01)
 (13 FEB 75)
 (PAGE 21)

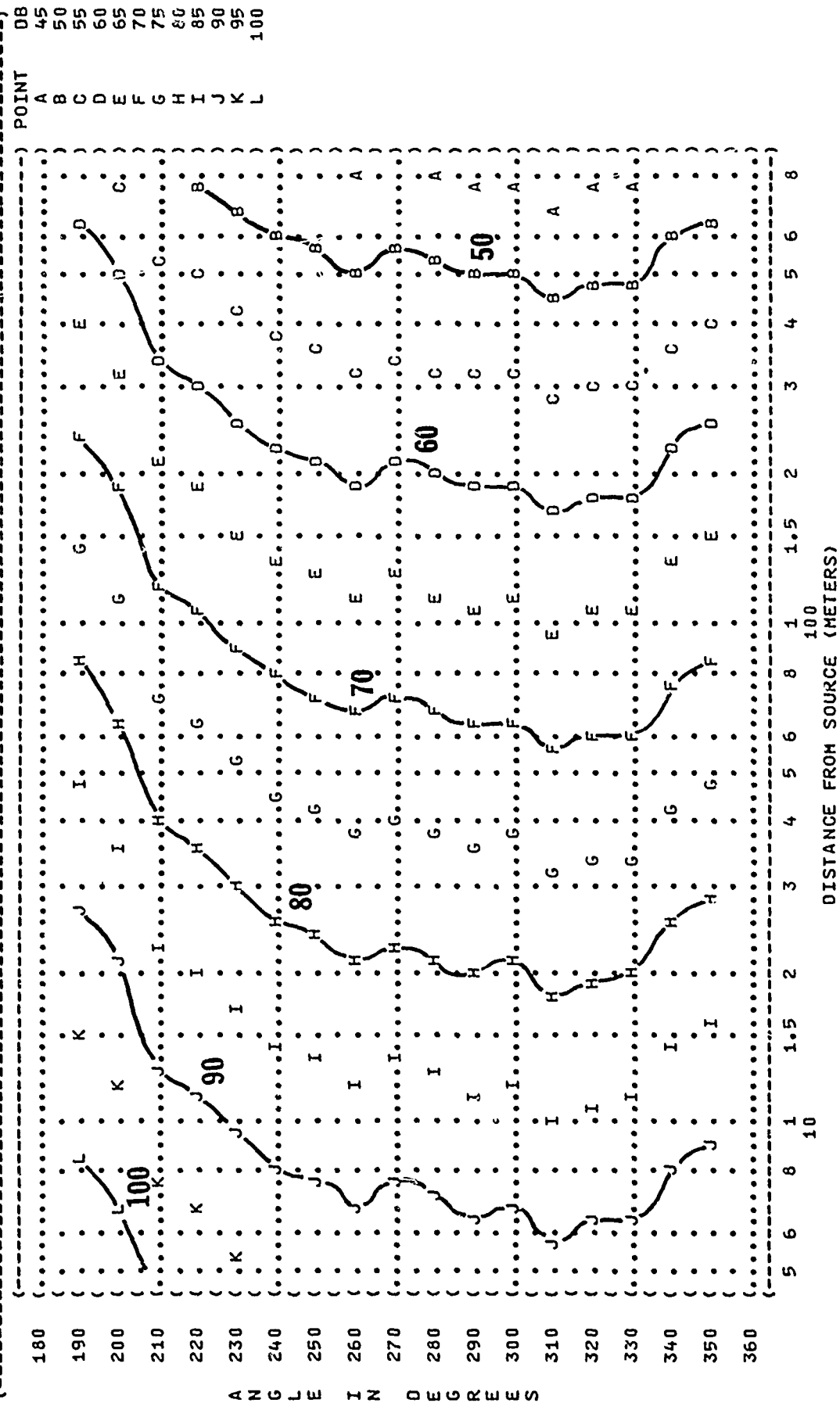


A N G L E I N D E G R E E S

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( ( FIGURE: SOUND PRESSURE LEVEL {SPL} ) IDENTIFICATION: )
( ( EQUAL LEVEL CONTOURS (DB) ) )
( ( 9 ) OMEGA 1.3 )
( ( 1000 HZ OCTAVE BAND ) )
( ( NOISE SOURCE/SUBJECT: ) )
( ( HA-1A POWER UNIT, GAS ) )
( ( TURBINE ENGINE ) )
( ( (CONTINENTAL) ) )
( ( FAR FIELD NOISE LEVELS ) )
( ( OPERATION: ) )
( ( 35,000 RPM (100%) ) )
( ( LOADED (40 PSI) ) )
( ( ) )
( ( METEOROLOGY: ) )
( ( TEMP = 15 C ) )
( ( BAR PRESS = .760 M HG ) )
( ( REL HUMID = 70 % ) )
( ( ) )
( ( PAGE 21 ) )

```



(FIGURE: SOUND PRESSURE LEVEL (SPL)
 (EQUAL LEVEL CONTOURS (DB)
 (9 4000 HZ OCTAVE BAND
 (IDENTIFICATION:
 (OMEGA 1.3
 (TEST 71-020-280
 (RUN 01
 (NOISE SOURCE/SUBJECT:
 (OPERATION:
 (HA-1A POWER UNIT, GAS
 (35,000 RPM (100%)
 (TURBINE ENGINE
 (LOADED (40 PSI)
 ((CONTINENTAL)
 (FAR FIELD NOISE LEVELS
 (METEOROLOGY:
 (TEMP = 15 C
 (BAR PRESS = .760 M HG
 (REL HUMID = 70 %
 (PAGE 23
 (POINT DB

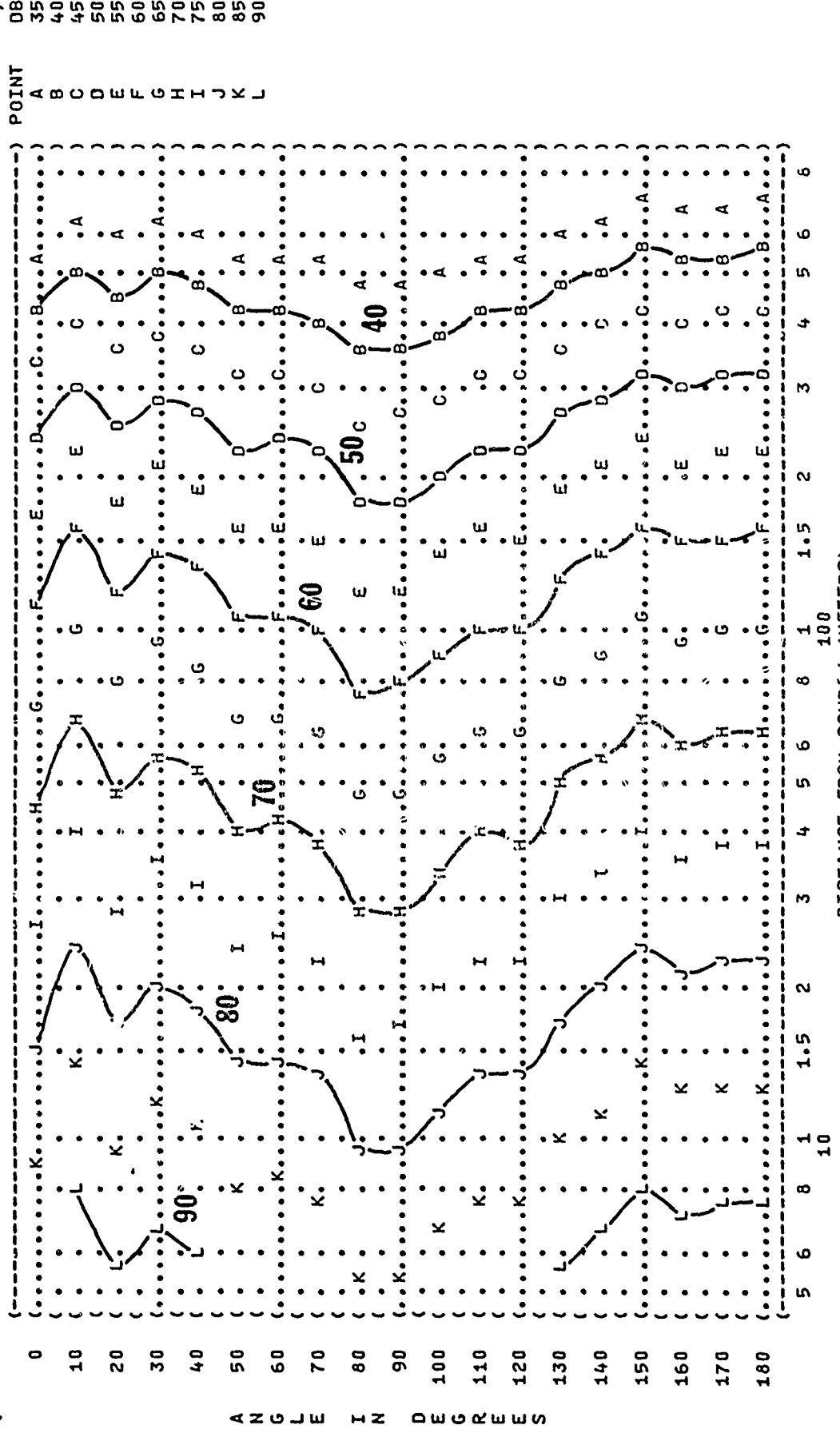
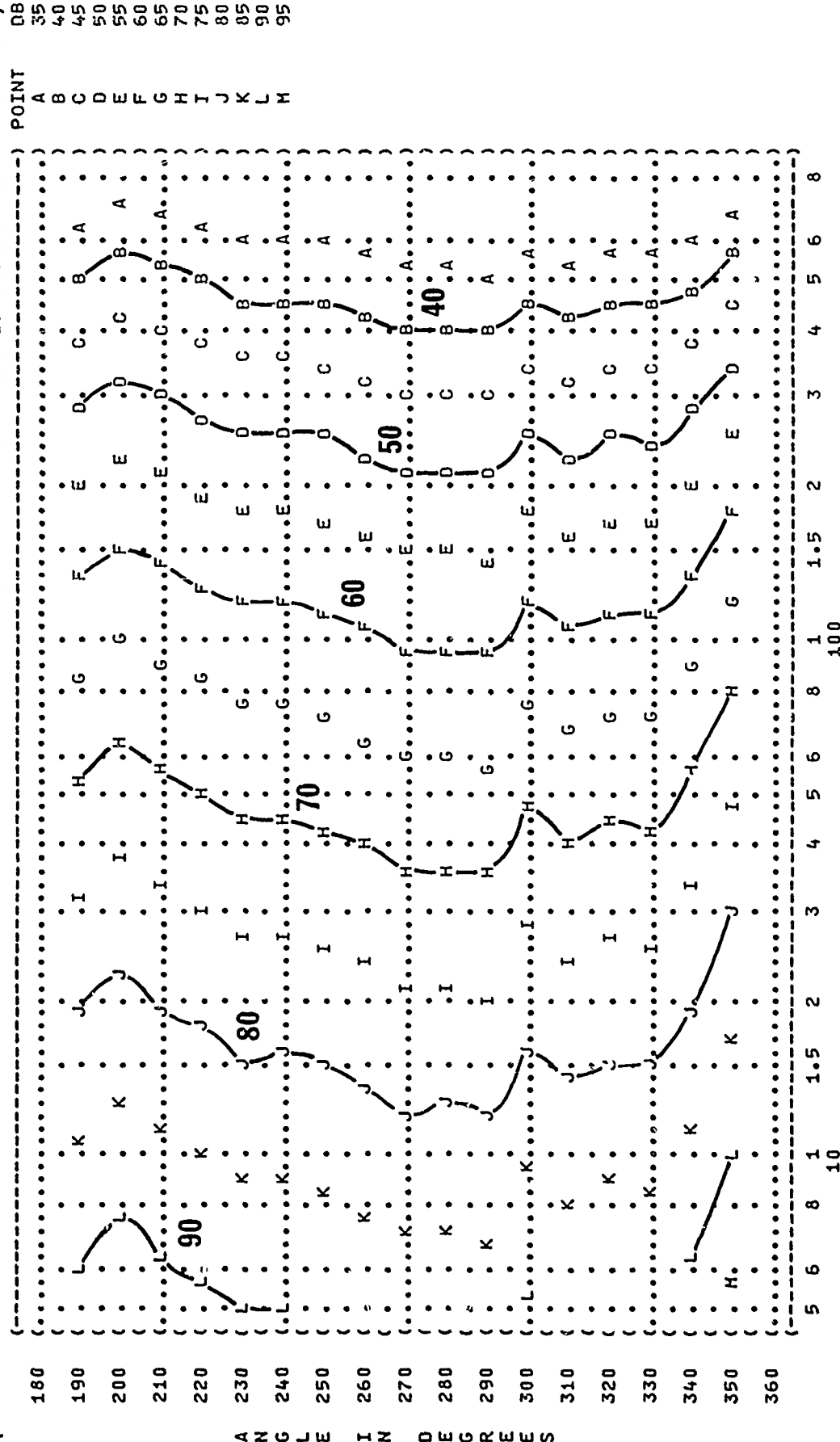


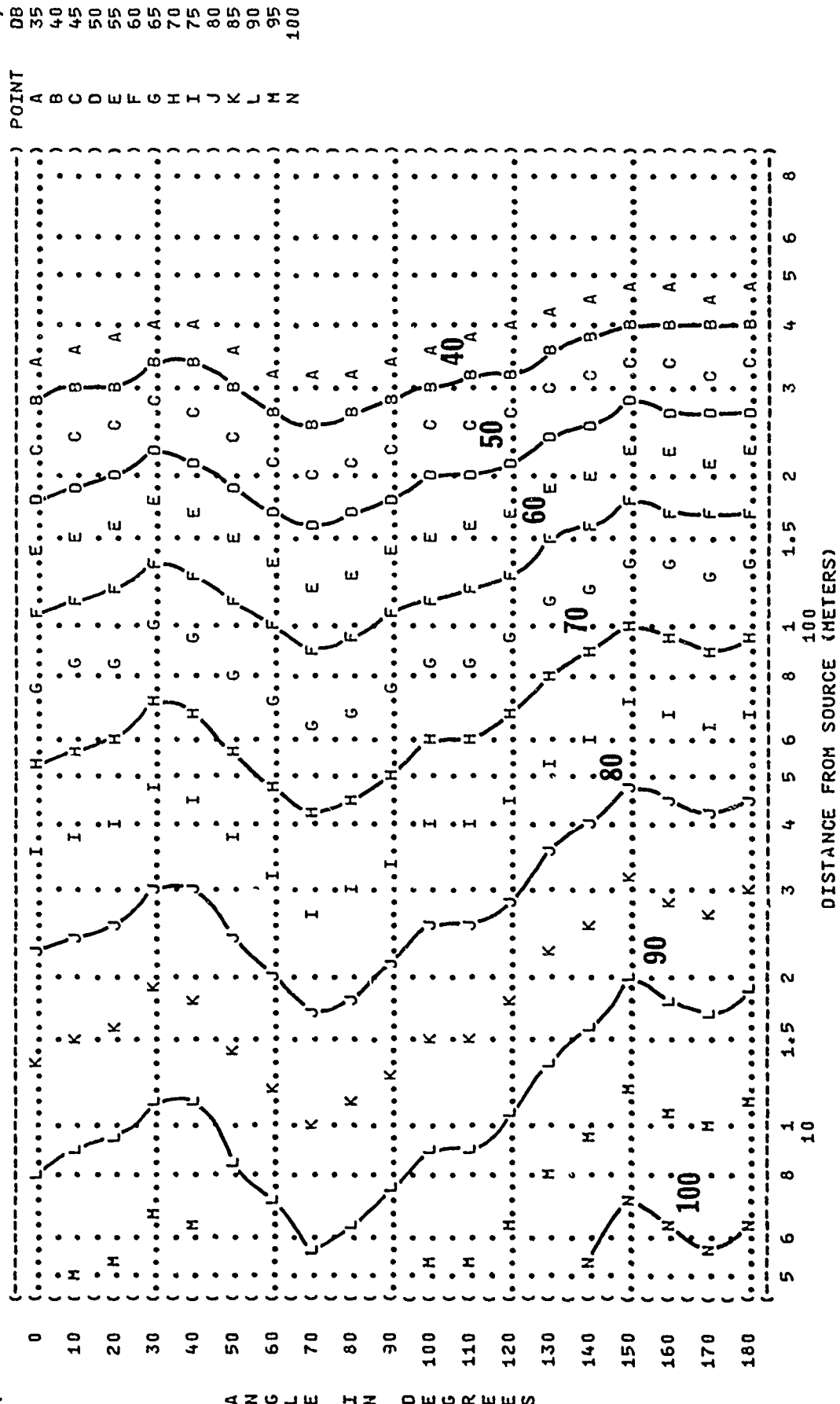
FIGURE	SOUND PRESSURE LEVEL	{SPL}	IDENTIFICATION
9	EQUAL LEVEL CONTOURS	(DB)	
	4000 HZ OCTAVE BAND		OMEGA 1.3
NOISE SOURCE/SUBJECT:			TEST 71-020-280
OPERATION:			RUN 02
HA-1A POWER UNIT, GAS			
TURBINE ENGINE			
(CONTINENTAL)			
FAR FIELD NOISE LEVELS			
METEOROLOGY:			
TEMP = 15 C			
BAR PRESS = .760 M HG			13 FEB 75
REL HUMID = 70 %			
			PAGE 23



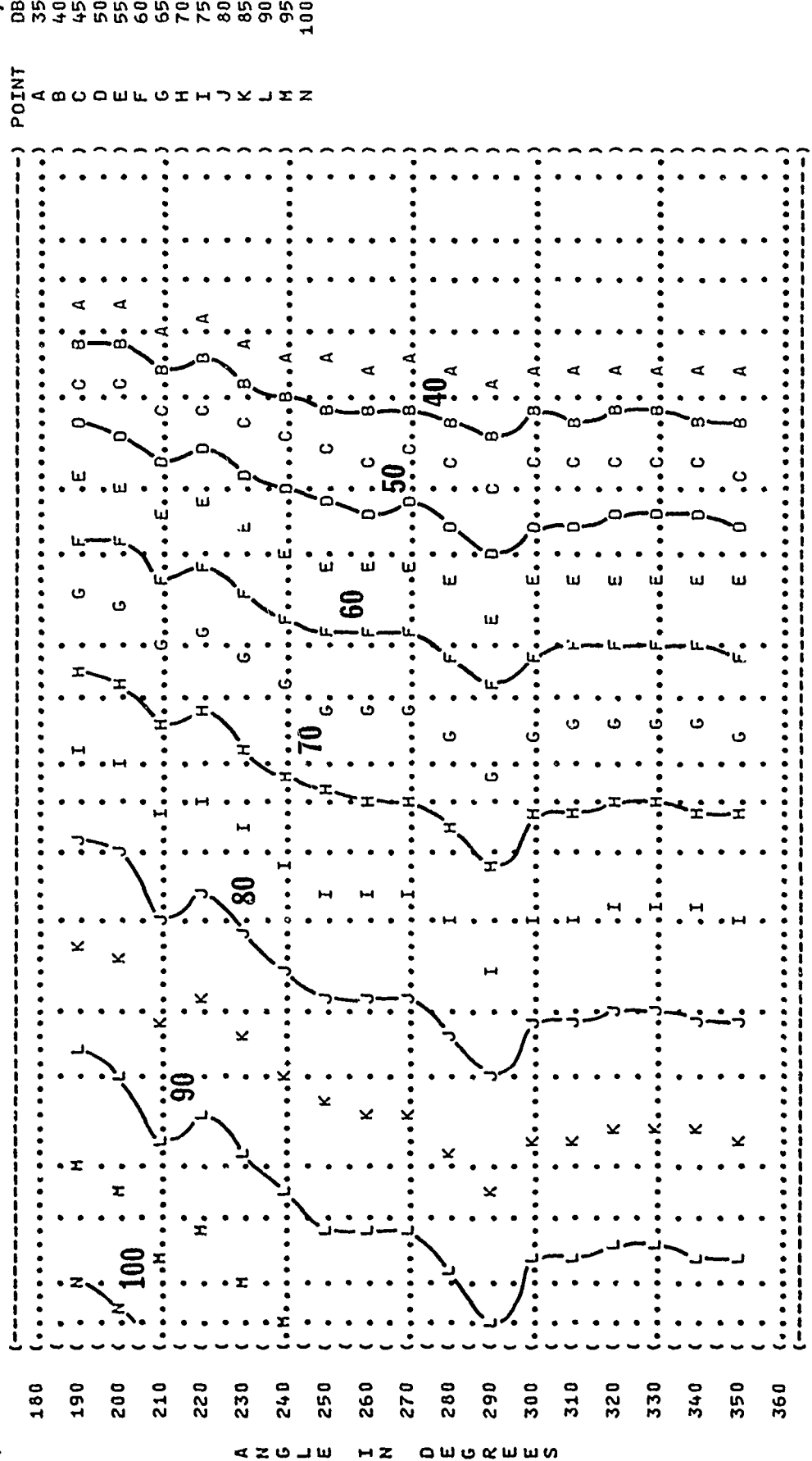
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(-----)
( ( FIGURE: SOUND PRESSURE LEVEL (SPL) ) IDENTIFICATION: )
( ( EQUAL LEVEL CONTOURS (DB) ) )
( ( 9 8000 HZ OCTAVE BAND ) )
(-----)
( ( NOISE SOURCE/SUBJECT: ) )
( ( MA-1A POWER UNIT, GAS ) )
( ( TURBINE ENGINE ) )
( ( (CONTINENTAL) ) )
( ( FAR FIELD NOISE LEVELS ) )
( ( OPERATION: ) )
( ( 35,000 RPM (100%) ) )
( ( LOADED (40 PSI) ) )
(-----)
( ( METEOROLOGY: ) )
( ( TEMP = 15 C ) )
( ( BAR PRESS = .760 M HG ) )
( ( REL HUMID = 70 % ) )
( ( PAGE 24 ) )
(-----)

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(FIGURE: SOUND PRESSURE LEVEL (SPL)) IDENTIFICATION:)
 (9) EQUAL LEVEL CONTOURS (DB))
 (8000 HZ OCTAVE BAND)
 (NOISE SOURCE/SUBJECT:) OPERATION:)
 (HA-1A POWER UNIT, GAS) (35,000 RPM (100%))
 (TURBINE ENGINE) (LOADED (40 PSI))
 ((CONTINENTAL))
 (FAR FIELD NOISE LEVELS)
 () METEOROLOGY:)
 () TEMP = 15 C)
 () BAR PRESS = .760 M HG)
 () REL HUMID = 70 %)
 () TEST 71-020-280)
 () RUN 02)
 () 13 FEB 75)
 () PAGE 24)



DISTANCE FROM SOURCE (METERS)

ANGLE IN DEGREES